Special Report: Application Packages Follows Page 64

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NEWSPAPER

COMPUTERWORLD

THE NEWSWEEKLY FOR THE COMPUTER COMMUNITY

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Thinking Smaller

Prime Computer, Inc. scaled down its Model 550 and came up with the Prime 250, which it introduced today. It also announced an OEM version of the system. Story on Page 5.

Honeywell DPS-330 To Compete With 4331

By Jay Woodruff
CW Staff

WALTHAM, Mass. — Honeywell, Inc. last week announced a medium-scale distributed processing system — the Level 64/DPS-330 — which offers three levels of instruction execution speeds and competes with the IBM 4331.

The DPS-330 supersedes both the Level 64/DPS-320 and 350, which will no longer be offered. Its highest level of processing power offers nearly 10% greater performance than the 350, Honeywell said.

The DPS-330 features microprogramming to promote greater CPU efficiency, as well as integrated mass storage and unit record processors and an integrated communications controller.

The machine can be used as a free-standing central computer or as a host to a network of up to 15 Honeywell Level 6 minicomputers. It supports the development of on-line data bases and telecommunications networks.

Like its predecessors, the DPS-330 allows data to be collected locally for immediate needs and relayed to the remote central computer as required. Hardware, software and applications can be arranged in user-convenient locations and later adjusted or changed to suit future processing situations, according to Honeywell.

By adding one or two power modules on-site, the power of the DPS-330 can be increased 1.55 and 2.3 times, respectively, the vendor said.

CPU firmware resides in bipolar read-only memory that Honeywell calls the control store. The memory boasts an access time of 100 nsec per 4-byte word. Up to five microinstructions can be executed in parallel by the logic subunit in a total of 315 nsec.

(Continued on Page 6)

IBM Users Get Add-On Alternative

By Tom Henkel
CW Staff

WALTHAM, Mass. — Cambridge Memories, Inc. (CMI) is offering an alternative to IBM add-on memory.

The concept, called add-in memory, is a 64K-bit MOS random-access memory (RAM) board that attaches to the IBM backplane.

Called Stor/3000, the memory board is said to offer four times the density of an IBM 16K-byte board without taking up additional space. The board is also more reliable than conventional add-on memory, can be delivered faster and is easier to install, CMI claimed.

Since it attaches directly to the IBM storage backplane, using as much IBM circuitry as possible, the Stor/3000 eliminates the need for complex interface logic, interconnect cables, redundant logic and power supplies, a CMI spokesman noted.

The add-in memory boards are available in 1M-byte increments for IBM 3031, 3032, 3033N and 3033 users. They can also be attached to 370/158 and 370/168 processors, according to CMI.

The boards cost about 30% less than the add-on equivalent offered by IBM. CMI President Joseph Kruy said the Stor/3000 costs about $30,000 per 1M

(Continued on Page 4)

Dataphone II Delayed Up to Four Months

By Phil Hirsch
CW Washington Bureau

WASHINGTON, D.C. — Delivery of AT&T's Dataphone II system will be delayed up to four months, the company told the Federal Communications Commission (FCC) last week. The delay could be a good deal longer, however.

Announced in October, Dataphone II is a troubleshooting service for private-line networks [CW, Oct. 22]. "The complexity of the system" was "underestimated" last November and December during "the final stages of technical development and operational planning," the telephone company said in a statement to the commission.

However, "no basic or fundamental software problems have been encountered," nor has any "major redesign" been necessary, at least so far. AT&T did not elaborate further except to say that the problems it has encountered with Dataphone II involve both hardware and software.

Originally, first shipments of Dataphone II hardware — consisting of four modems, a network controller

(Continued on Page 2)

Caucus Winner George Bush Sows DP Power, Reaps Funds

By Marguerite Zientara
CW Staff

HOUSTON — A combination of word processing technology and remote computing power has proven a boon to the direct mail fund-raising efforts of presidential candidate George Bush, who last week unexpectedly led the Republicans in the Iowa caucus.

With $1.5 million raised so far through direct mail appeals, National Finance Director Frederick Bush (no relation) attributed the success of his methods to the latest technology. "What is so beautiful now is the versatility of personalized letters from our IBM Office System/6 word processor with extremely high-quality print," according to Bush, based here.

"The letters really *do* look individually typed and they *don't* look computer-generated," according to

Election 1980

Bush, who has been involved in politics for eight years and political fund raising for five. While the letters themselves are not actually generated by computer, much of the data used to produce them is stored in computer memory.

Under contract with Bush, Creative Mailing Consultants, Inc. of Capitol Heights, Md., maintains data on previous contributors on an IBM 370/115 and a 370/135.

"If we want to break down our contributor list by state, Zip Code or size of contribution, Creative Mailing can write a program to extract those names and send them to us over phone lines onto our System/6's floppy disks," the finance director explained.

"Then the [data on the disks] is converted by the Sytem/6 onto mag cards," he said. "The mag cards go into the printers, which read them

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Managing Editor Nancy French

Senior Editors:
Software Donald Leavitt
Industry Marcia Blumenthal
Communications Brad Schultz
Features John C. Whitmarsh

Senior Writer:
Communications Phil Hirsch

Correspondents:
West Coast Jeffry Beeler
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Writer/Analyst Marcy Rosenberg
Staff Writers Tom Henkel
Timothy J. Scannell
Connie Winkler
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Editorial Cartoonist Jim Orton

Contributors:
Education J. Daniel Couger
Taylor Reports Alan Taylor
Human Connection Jack Stone

For Sales, Circulation and Production contacts, see inside back page.

Please address all correspondence to the appropriate department at 375 Cochituate Road, Framingham, Mass. 01701. Phone: (617) 879-0700. Telex: 95-1153

OTHER EDITORIAL OFFICES:
West Coast: 407 California Avenue, Suite 10, Palo Alto, California 94306. Phone: (415) 328-8064.
Washington, D.C.: 821 National Press Building, 529 14th Street N.W., Washington, D.C. 20045. Phone: (202) 347-6718.
England: Steve Burton, IDG Publishing Ltd., 140-146 Camden Street, London NW1 9PF Phone: 01-267 1201. Telex: 851 264737.
W. Germany: Eckhard Utpadel, CW Publikationens, Friedrichstrasse 31, 8000 Munich 40, Phone: (089) 34-90-61. Telex: 5215350.
Asia: Hidetsuna Sasaki, Dempa/Computerworld Company, Dempa Building, 1-11-15, Higashi Gotanda 1-chome, Shinagawa-ku, Tokyo 141. Phone: (03) 443-6101. Telex: J2424461.
Australia: John P. Costello, Computerworld Pty. Ltd., 3 Bruce Street, Crows Nest, NSW 2065. Phone: 929-5388, Telex: SECCO AA25468.
Brazil: Eric Hippeau, Data News, Computerworld do Brazil, Servicos e Publicacoes Ltda., Rua Alcindo Guanabara, 25/10th floor 20031 Rio de Janeiro, RJ Brazil. Phone: (021) 242-7395 or 263-8046. Telex: 2130838(WORD BR).

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Charges Breach of Contract

Harris Suing Iran for $9.3 Million

By Tim Scannell
CW Staff

ORLANDO, Fla. — Harris Corp. has filed a lawsuit for more than $9.3 million here against the government of Iran, charging it breached a contract that called for the company to manage the installation of a sophisticated electronic intelligence-gathering and data processing system.

If Harris wins the case, monetary awards to the company could come from Iranian assets frozen by President Carter last November.

Harris is asking the U.S. District Court for the Middle District of Florida to award it $2,314,934 in contract termination costs and $7 million for profits that were lost by the contract's termination. The communications and information processing vendor also asked the court to confirm that its contract performance guarantees to Iran are now invalid, as provided for in a clause covering "force majeure," the legal phrase for a major, uncontrollable event — in this case, a revolution.

The system was scrapped when the Ayatollah Khomeini's forces took over Iran last February.

Military Intelligence

Awarded to Harris in 1977 by Iran's Ministry of War, the contract required that the firm coordinate the equipment and efforts of nearly a dozen U.S. companies in installing a military intelligence system. A Harris spokesman sketchily described the electronic system as nonoffensive in nature and geared solely for military information-gathering purposes. Harris declined to identify the other companies involved in the project.

The total cost of the system was in the vicinity of $65 million. Harris said it received payments covering the work it had actually performed, so that no out-of-pocket loss to the company is involved.

The suit traces a complex trail of events that include the "disappearance" of the Iranian agency that issued the contract during the Shah's regime, the hurried evacuation of Harris employees from Teheran last Feb. 18 and the company's unsuccessful efforts since then to negotiate for a termination and to settle financial aspects of the contract with Iran's banking and governmental authorities.

Presently, the lawsuit is being translated into Farsi, the recognized Iranian language, before it is served to representatives of the Iranian government.

Bell's Dataphone II Delayed

(Continued from Page 1)

and diagnostic console — were scheduled for February and March. Now, first shipments will be delayed one to three months. They will begin in March rather than February for the 2024A modem, network controller and diagnostic console; in May instead of March for the 2048A and 2048C modem; and in June instead of March for the 2096A modem.

Originally, the company anticipated "full production of the data sets by mid-1980." The new plan calls for "scheduled availability" to begin in July for the 2024A, network controller and diagnostic console, in September for the 2048A and 2048C and in October for the 2096A.

Footnote to Statement

Apparently, it will take a longer time to reach "full production" because, in a footnote to its FCC statement, AT&T said that "in scheduling availability of Dataphone II service data sets and associated equipment, customer order shipment commitments will be made on the basis of the production schedule.

"The number of units produced during the early months of production and available for customer delivery will be necessarily limited, increasing rapidly as production techniques are finalized and put in place."

There may be even further delay in getting Dataphone II to market because of the fight now going on between AT&T and the Independent Data Communications Manufacturers Association (IDCMA) at the FCC.

IDCMA has accused the phone company of prematurely announcing the offering as a way of discouraging sales of competing systems. In addition, the rates proposed for Dataphone II service grossly understate AT&T's true costs, IDCMA contends.

The trade association has asked the commission to suspend or reject the Dataphone II tariff, now scheduled to become effective Feb. 29. Because of the technical problems, however, it now seems virtually certain the Feb. 29 effective date will slip several days (it was originally Jan. 4). Moreover, by admitting that problems have arisen, AT&T is adding weight to IDCMA's complaint that the original product announcement was premature.

Under its rules, the FCC could suspend the tariff for up to five months.

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WHITLOW COMPUTER SYSTEMS Inc. 560 Sylvan Ave., Englewood Cliffs, N.J. 07632

IBM 370s on Their Marks To Support 1980 Olympics

ARMONK, N.Y. — Two IBM 370/148 mainframes stand ready to support the 1980 Olympic Games in Moscow if they are held as planned.

A spokesman for IBM's corporate headquarters here confirmed last week that the dual-processor configuration has been in Moscow for about a year now and is intended to help process the results of competition.

But President Carter put a damper on plans for this type of application a few weeks ago when he imposed an embargo on U.S. high-technology products marketed to the Soviets [CW, Jan. 21]. Applying in part to computer systems, the trade cutoff was in protest of the Soviet invasion of Afghanistan, Carter said.

IBM Comment

Although the embargo became effective well after the 370/148s were installed, IBM said it does not know whether the federal action will affect commitments to support the Moscow facility.

Hence, what the International Olympic Committee — overseer of the games — might do if the systems should require service is unclear, the spokesman observed.

U.S. Nixes Spare DP Parts For Soviet Auto Works

WASHINGTON, D.C. — The Kama Auto Works in the Soviet Union will have to do without spare parts for its IBM System/7 process control minicomputers and an IBM 370/158 as a result of last week's decision by the Carter Administration to ban export of those parts.

The components are valued at $80,000.

The Kama facility manufactures about 25% of the Soviet Union's trucks. It is believed to be the supplier of the military vehicles that rumbled into Afghanistan this month, ferrying Soviet troops and supplies.

IBM sold the 10 System/7s and the 370/158 mainframe to the Soviet Union in 1975 for process control and management information collection, respectively.

The export ban, announced by the U.S. Department of Commerce, marked an escalation in the U.S. protest against the recent Soviet invasion of Afghanistan.

Gold Medalist DP Manager Supports Olympics Boycott

By Brad Schultz
CW Staff

BETHPAGE, N.Y. — In the athletic sense, probably no man has more clout as a data communications manager than four-time Olympic Games gold medalist Al Oerter, who last week told *Computerworld* he supports a U.S. boycott of this summer's Moscow games.

President Carter recently called for a boycott of the Moscow Olympics to protest the Soviet Union's invasion of Afghanistan.

After a decade in retirement from competition, the 275-pound Oerter, who manages remote processing for Grumman Data Systems Corp. here, has trained hard for a chance to enter his fifth Olympics as a discus thrower. And that training has had computer support from a novel "biomechanical analysis system" based on a minicomputer and intelligent graphics terminal [CW, June 18].

Now in his mid-40s, Oerter said a fifth Olympics was the primary objective of his unusual break from sports retirement. While he was "disappointed" by the circumstances that may put that goal forever out of reach, he plans to continue competing.

"I am very definitely supporting that boycott effort," Oerter asserted. "I would hope that all athletes will get behind it and that [U.S. athletes] will gain the support of several strong competing countries."

If enough athletes from a number of countries show "unity" in the protest effort, the International Olympic Committee (IOC) may agree to locate the games outside the Soviet Union, Oerter pointed out, adding "I don't think the U.S. by itself can create that change.

"My guess at this moment is that ... several countries will determine for themselves how apalled they are by the aggression in Afghanistan and decide to withdraw from the games." Although such actions would "at least make the IOC think," the committee, which administers the games, will probably not move to relocate them, the discus thrower said.

Psychological Toll

As to his personal situation, Oerter indicated that this imbroglio has taken its psychological toll. At roughly twice the age of most world-class discus throwers, the data communications manager has spent a few years in a prodigious training program that had another medal in Moscow as its ultimate goal.

Nevertheless, Oerter predicted he will be competing for some time to come and suggested he is considering other major track and field meets as alternative objectives.

Meanwhile, he continues to train with the biomechanical analysis system, which is comprised of a Data General Corp. Eclipse computer systems and a Megatek Corp. Whizzard 7000 graphics terminal. DG and Megatek donated that equipment to the U.S. Olympic Committee in a formal presentation at last year's National Computer Conference.

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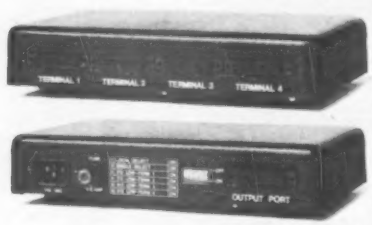

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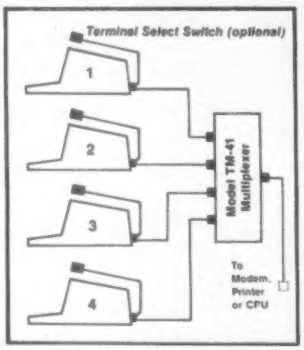

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CMI Offering Add-In

(Continued from Page 1)

byte compared with $50,000 for 1M byte of IBM add-on memory. One-, two-, and three-year leases are available, but the firm could not quote rates.

Transparent System

Because of its transparency, the memory system is said to accommodate all IBM hardware, software and maintenance capability without alterations.

The memory boards reportedly have been working several months at two test sites, but CMI would not disclose the locations of those sites.

Technology for the boards is based on 64K-bit MOS RAM chips supplied through two Japanese vendors. In the event of shortages of 64K-bit chips, CMI will substitute the equivalent memory size in 32K-bit or 16K-bit chips, as an interim measure.

CMI has at least a two- month supply of 64K-bit chips in stock, Kruy said.

Compared with IBM's 16K storage modules, Stor/3000 offers four times the storage capacity, although both take up the same amount of space in the mainframe, CMI said. In addition, the CMI product uses IBM's standard MST logic, eliminating the need for translation circuitry

CMI claimed its add-in memory is more reliable than add-on memory since it eliminates the need for more than 600 trilead connections required by add-on memory units. The Stor/3000 unit requires only 12 trilead connections, the vendor said.

CMI said it can deliver the add-in memory in 30 to 60 days and install it in less than four hours.

Two Card Types

Similar to IBM memory boards, Stor/3000 has two active card types — storage and address. Each card type is interchangeable in similar locations.

All CMI address and storage cards fit in the space taken up by one IBM card. The difference is that one of CMI's 64K cards equals four IBM 16K cards, CMI noted.

In addition, CMI, like IBM, offers new storage protect cards for each increment of new memory when necessary. CMI protect cards are interchangeable with IBM protect cards, according to CMI.

Stor/3000 is also said to allow maintenance from a console using diagnostic and debugging procedures similar to IBM's.

An additional maintenance plus, Kruy claimed, is Stor/3000's ability to let the user take off-line any multiple of 2M-byte increments of IBM or CMI memory on a 3032, 3033N or 3033. The reconfiguration increment is 1M byte on a 3031.

The Stor/3000 also uses less power and gives off less heat, CMI said from 360 Second Ave., Waltham, Mass. 02154.

'Like a Miniature VAX'

Prime Brings Out Scaled-Down Version of 550

By Tim Scannell
CW Staff

WELLESLEY HILLS, Mass. — Prime Computer, Inc. added fuel to its 32-bit minicomputer fire today by introducing a general-purpose system that is basically a scaled-down version of its Model 550, announced about a year ago as part of the Series 50 line.

Covering all marketing bases, the company also announced an OEM clone of the new machine that will be targeted toward systems builders and designers.

The end-user-oriented Prime 250 incorporates the same system architecture and Primos operating system software as the firm's large-capacity 450, 550, 650 and 750 processors. However, the 250 provides only about 60% of the 550's performance.

In addition, while the 550 can typically support 10 to 20 users, the 250 handles five to eight users depending on the application, a spokesman said. However, the system can be configured to juggle 16 simultaneous users.

Communications Ability

With up to 1M byte of main memory and the ability, through Primenet, to communicate via local high-speed loops, packet-switching net works or private synchronous lines, the Prime 250 competes with such machines as Hewlett-Packard Co.'s HP 3000, Data General Corp.'s Eclipse and IBM's Series/-1. In fact, the system functions "like a miniature [Digital Equipment Corp.] VAX, if there were one," the spokesman claimed.

The Prime 250 can be interfaced to a variety of communications lines with multiple protocols such as IBM Sync for Hasp and 2780, the High-Level Data Link Control protocol for X.25 packet-switching networks, Control Data Corp.'s 200UT, Univac's 1004 and International Computers Ltd.'s 7020, he stated.

The entry-level 250 has 512K bytes of error checking and correcting main memory; the Primos operating system software; floating-point instructions that are embedded in the system's microcode; a 2K-byte, 80 nsec access cache memory that acts as a buffer between the CPU and memory; and a 32M-byte cartridge module disk system that can be optionally replaced by a 64M- or 96M- byte model.

The system also boasts a CRT console, an eight-line asynchronous controller and a business instruction set formatted to Ansi '74 Cobol standards, the spokesman continued.

The minicomputer is compatible with all Prime peripherals and I/O interfaces. It includes a multilevel hardware-controlled ring memory protection system that assigns programs to different security levels, protecting them from unauthorized access.

Reinforcing Prime's claim that the Series 50 is an upwardly compatible group of machines, the 250 was designed to allow users to move to a higher system level within its DP family.

For instance, the minicomputer can be field-upgraded to a 550 by adding seven more chassis slots to the 250's 10 and replacing and plugging in additional boards.

The machine's OEM counterpart, the Model 150, has basically the same features as the 250, but is furnished with 256K bytes of main memory and patterned after Prime's other Series 50 OEM, the Model 450.

The Prime 250 ranges in price from $59,500 to $71,000, depending on the configuration. The 150 costs $49,000 with a minimum purchase of five systems.

Prime is located at 40 Walnut St., Wellesley Hills, Mass.

Spangle Going To Memorex

SANTA CLARA, Calif. — Clarence W. Spangle, president of information systems at Honeywell, Inc., was selected by Memorex Corp. last week to become its new president and chief executive officer.

Stephen G. Jerritts will replace Spangle at Honeywell while continuing to act as head of Honeywell's U.S. Information Systems Group.

Spangle had been with Honeywell for 20 years. In charge of Honeywell's computer operations and a director of the company since 1969, he will assume his new position at Memorex on March 1.

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Honeywell Raises Some, Lowers Other Prices

By Jay Woodruff
CW Staff

WALTHAM, Mass. — Honeywell, Inc. has increased most of its hardware, software and maintenance prices while at the same time announcing "significant" price reductions on certain communications and memory products.

The firm blamed inflation for the price hikes. Rental and lease increases ranged from 7% — on the Series 60 Levels 62, 64, 64DPS, 66 and 66DPS — to 20% for accompanying application software and selected peripherals.

All increases went into effect Jan. 21 for new orders; they will be implemented April 21 for the firm's present users. The price jump came two weeks after an IBM announcement of increased prices for most of its product line.

Like IBM, Honeywell left some prices unchanged. For example, the cost of the Level 63 and 64 central processors will remain the same.

However, Honeywell did increase maintenance costs on these systems by 5% and 10%, respectively.

Rental and lease prices for Series 60 machines on a five-year plan are now $855/mo for a Level 62, $2,205/mo for a Level 64/DPS-320, $25,043/mo for a Level 66/DPS and $9,800/mo for the Level 66/10.

Memory for the Level 66 systems costs less, although Honeywell announced no change in its lease rates. The cost of 64K words of added memory is down 75% from $105,360 to $30,000, while 128K words of memory was cut 43% from $97,440 to $55,000.

Level 66 Gcos III DM-IV basic system software went up 10% from $715 to $786/mo, while the support service charge was increased 10% to $196. The Cobol 74 compiler and runtime facility for Level 66 systems was raised by a similar percentage to $207.

DPS 8 Hikes

Honeywell's recently introduced DPS 8 family [CW, Oct. 15] got the biggest purchase price boost-15% — even before the first scheduled delivery. System costs now stand at $171,405 for the DPS 8/20, $259,326 for the DPS 8/44 and $640,424 for the DPS 8/52, all with 1M byte of storage.

The largest processor in the series, the DPS 8/70, escaped an increase. Its price remains at $1,156,000.

Rental prices were another story, however. All DPS 8 systems are now 20% higher. The 8/20, 8/44, 8/52 and 8/70 now carry monthly rental fees of $4,432, $6,299, $15,621 and $31,940, respectively, on a five-year plan.

Add-on memory for the 8/20 and 8/44 was raised 15%, but with a 25% increase, the 8/52 and 8/70 did not get off so lightly.

DPS 8 software received a 10% increase; the Gcos 8 DM-IV standard facility now costs $809/mo. Extended support service was increased from $185/mo to $203.

The purchase price of the Datanet 355 communications processor was reduced 20% from $88,320 to $70,656, but lease prices (on a five-year term) rose from $1,893 to $2,026.

Rental and lease prices on certain older products not actively marketed, such as the Honeywell Series 200/2000 and Series 6000 computer systems and the Xerox computer products, increased 7% to 12%. Maintenance went up 7% to 10%.

Hourly and monthly charges for systems engineering rose 18%, while on-call field engineering hourly rates and time and material rates rose 16% and 17%, respectively.

Honeywell Adds Rival for IBM 4331

(Continued from Page 1)

I/O programs are separate from those of the CPU and give precedence to high-speed devices by grading them in four priority levels.

Peripheral Processors

Peripheral processors are connected to the CPU by high-speed I/O channels, eliminating the need for CPU management of I/O operations after they have been initiated. Two 1.25M byte/sec channels are standard on the processor, expandable to 12.

Total system throughput is as high as 5.2M byte/sec, Honeywell claimed.

Peripheral processors are microprogrammed and include read-only storage, read/write memory, and arithmetic and logic unit and an individual or shared maintenance panel. These functions can be executed at the peripheral subsystem level on the unit record, mass storage or magnetic tape subsystems, leaving the CPU free for tasks other than I/O operations.

Network Host

When the DPS-330 is configured in a network with as many as 15 Level 6 minis (with two printers per station), the Level 6s are capable of processing local work and at the same time providing on-line facilities and interactive data entry to the host, Honeywell continued.

One communications controller is standard and two more can be connected. A controller supports up to 15 synchronous and/or asynchronous lines operating at speeds from 45- to 19.2K bit/sec.

Each line supports a variety of up to 32 automatically polled terminals operating on switched, private and direct-connect lines.

Runs Under Gcos

The DPS-330 runs under Honeywell's Level 64 Gcos operating system, which combines batch, real-time, transactional and distributed processing and interactive time-sharing capabilities. The disk-based operating system can support the concurrent execution of up to 64 jobs, more than double the previous specification of 31 jobs, Honeywell said.

The operating system features Cobol, Fortran, RPG and Basic language processors; the TDS/64 transaction processing system; and a Codasyl-compatible data base management system called IDS/II. Users of older Honeywell systems such as the Series 200/2000 and G-100 series can migrate to Level 64 Gcos with a variety of aids, the vendor added.

With the DPS-330, Honeywell also announced system software products that will be made available on a limited basis in the fourth quarter as part of Release 0500 of Level 64 Gcos. They are:

- Multiple Logic Data Store (MLDS), which the vendor described as an "advanced indexed access method for creating permanent or temporary secondary indexes and a hierarchical data structure through the use of primary/complementary record sets." Complementary records were defined as a chain of records logically related to a given primary record, such as hotel bookings or employee history items. MDLS can be used by IBM System/3 users as an aid for migration to the DPS-330.
- Immediate Step Activation, which enables the Interactive Operation Facility terminal user to interactively execute Cobol, Fortran and RPG language processors, the static linker and user object programs. With it, each phase of program development is handled as part of the IOF job rather than having to queue up for batch execution. Immediate Step Activation is priced at $83/mo.
- Interactive Program Checkout Facility, designed for use with Immediate Step Activation to shorten program debugging time. It costs $55/mo.
- File Transfer Facility/6, which transfers one or more Level 64 sequential files or subfiles to or from one or more Level 6 minis and handles binary and character mode information. It costs $38/mo.
- Preforms, which is available now, allowing the user to compose, modify and store screen formats for the Honeywell VIP 7700 and 7760 CRT terminals in both batch and transaction modes. Output — either Cobol source lines or object code — can be retrieved by programs running in Cobol or transactional environments, Honeywell said. Preforms costs $7/mo for batch and $14/mo for interactive versions.

A basic DPS-330 with 512K bytes of memory, two I/O channels, two peripheral processors, one communications controller and a freestanding CRT terminal console costs $79,675 and leases on a five-year plan for $2,014/mo.

The purchase price for the first and second power modules are $35,730 and $47,640, respectively, with lease prices of $850/mo and $1,133/mo.

A 256K-byte memory module costs $7,500 and leases for $180/mo, while the 1M-byte memory costs $30,000 and leases for $720/mo.

Level 64 Gcos is provided under license at no extra cost.

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Depends on RPG-II Programming

Road From System/3 to 38 May Be Rocky: IBM

By Tom Henkel
CW Staff

NEW YORK — IBM System/3 users that did not follow IBM's suggested RPG-II programming methods to the letter may find conversion to the System/38 a bit of a challenge.

At a demonstration here last week, IBM's system manager on the System/38 project called that processor an unforgiving one when it comes to accepting modified RPG-II files from a System/3, even though the General Systems Division offers a software package to aid in the conversion.

Brian Utley also warned that other past sins may catch up with users during conversion. Many will find their RPG-II programs not well enough documented to easily make the file changes needed to move from System/3 RPG-II to System/38 RPG-III, Utley said.

In both cases, users can get help at IBM conversion classes beginning next month at various locations around the country. Users that stayed loyal to RPG-II are also advised to take the course, Utley said.

Bugs Ironed Out?

Although IBM claims conversion to System/38 should be anything but a harrowing experience, those users converting from a batch-oriented System/3 to an interactive System/38 are likely candidates for problems. However, a team of IBM System/38 experts at last week's demonstration declined to speculate how long it would take an average user to convert.

As for the system itself, the IBM team put a 1.5M-byte System/38 Model 5 CPU through a series of canned programs to show that the machine actually works and that all the bugs have been ironed out. Exactly what the bugs were, however, is still somewhat a mystery.

The problems were rumored to be related to the operating system, causing the batch segment of the system to do some serious thrashing. IBM still doesn't want to talk about what went wrong; it is sticking by its original statement that the system was delayed six to nine months to allow for additional testing to take care of "minor glitches."

Why IBM delayed system rather than correcting the minor glitches on regular maintenance runs on installed systems is another question IBM doesn't care to address. Utley said the glitches were not concentrated in one area more than others.

However, he did mention the batch sequence as one area that ran slower than IBM originally said it would. With those problems apparently solved, Utley said the batch sequence now runs up to IBM's expectations.

Some IBM watchers keeping tabs on the troubled System/38 disagreed, however. One such analyst, Dave Stein of the Gartner Group, contended that even with glitches removed, the batch sequence will still run about 15% slower than originally predicted.

Asked to comment on Stein's contention, Utley replied that he could not calculate performance to such narrow bounds as 15%.

The IBM demonstration included a showing of the System/38's menu-driven security system that tells the user what he's allowed to do and how to do it, along with a demonstration of the system's graphics capabilities. The IBM team took a given set of data, put it into various kinds of graphs and reports and changed variables without affecting other users working with the same data.

Using a hypothetical airlines application, the IBM team showed the system's data base capabilities by updating the arrival time on a theoretical flight. The system then automatically updated related files, such as departures of the same flight at various cities along the theoretical route.

Also demonstrated was the service mode, which allows the user to run any of 18 diagnostic functions while the machine is being used on-line.

In addition, the System/38 will keep track of errors, when they happened and what I/O unit was being used at the time. This, IBM said, lets customer engineers diagnose and solve problems faster.

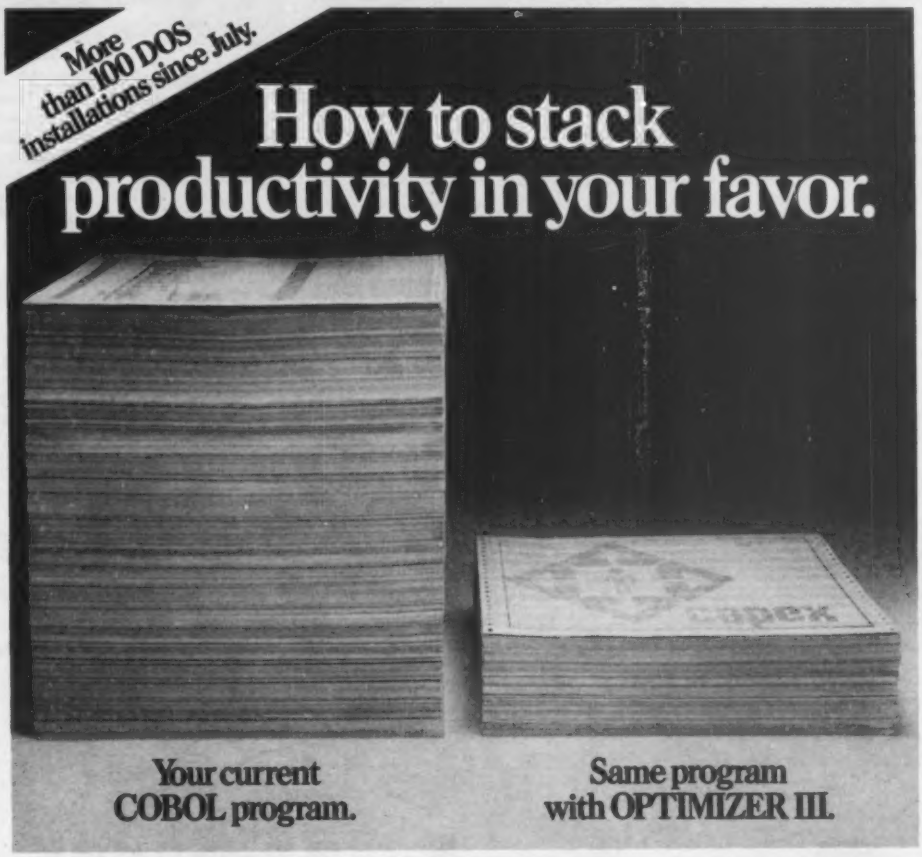
In addition to the Model 5 at the New York training center, about 200 other System/38s are at test sites around the world, the company said. Fifteen such sites are in the U.S., but IBM would not disclose the location of those sites.

First end-user deliveries of the System/38 are scheduled for July.

Corrections

In "Nasa to Lead Air Collision Research" [CW, Jan 14], two microcomputer model numbers were identified incorrectly. Besides Intel Corp.'s 8086 microprocessor, Megadata Corp. is considering the Motorola Corp. M-68000 and the Zilog, Inc. Z8000 for its collision avoidance system.

In "Forty-Four Packages Make Honor Roll" [CW Jan. 14] Software 1040 was not mentioned, although it appeared in the accompanying chart under "Three-Time Winners."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AT&T Unveils Some Plans For the '80s

By Phil Hirsch
CW Washington Bureau

WASHINGTON, D.C. — AT&T last week announced technological innovations for the 1980s that include single-sideband microwave transmission, slated for this year, and a multiplexing scheme for voice called Analog Time-Assisted Speech Interpolation (Tasi), slated for 1983.

Together, these are expected to quadruple the capacity of present microwave transmission channels.

Bell Laboratories also reported at the news conference here that a digital signal processor based on the MAC-4 microcomputer, which Bell Labs announced last year will be formally announced next month. The processor offers the improved filtering and bit-compression capabilities needed in systems that convert voice signals from analog to digital form.

Other innovations may enable Bell to convert its existing cable and radio systems from analog to digital, according to AT&T Long Lines President Robert W. Kleinert.

Finally, Bell announced a 611-mile fiber-optic transmission trunk between Washington, D.C. and Boston. The first leg of the cable, between Washington and New York City, is scheduled to begin operation in 1983.

Voice traffic will use 90% of the trunk's capacity, Kleinert said.

The lightwave transmission trunk will contain 144 optical fibers, each capable of carrying 672 one-way voice conversations or a 45M bit/sec data stream. It will directly inter-connect 19 of Bell's No. 4 ESS-equipped central offices.

The fiber-optic line will be the longest in the world, traversing a total of seven states, plus the District of Columbia. Construction will cost $79 million; if coaxial cable were used instead of optical fiber, the line would cost $129 million.

Bush Sows DP, Reaps Funds in Iowa

(Continued from Page 1)

and print the information." The printers are four IBM 1,000-word/min ink jet printers, which can print a letter and an envelope every 45 seconds.

Bush has also contracted with National Direct Mail Services in Bethesda, Md., which has an IBM laser printer that generates 36 letters per minute, but without envelopes.

Trompe L'Oeil

In 1980, word processing technology and computerized mailing lists have combined to become the trompe l'oeil of politics: Things are not what they seem.

"Personalized" letters can cite the exact amount a donor has given to date, can acknowledge that the recipient indicated he wanted to give an unspecified amount while prodding him to be specific and can do all these things within 24 hours of getting the information.

While personalized letters are the key to effectiveness in a direct mail campaign, the question of to whom to send them is just as important when each letter costs as much as 30 to 35 cents to compose and mail.

Even in the Bush-for-President 's relatively small political-persuasion mailing effort, there is always an option for the recipient to donate funds. "If you're going to spend 15 cents on bulk postage for a political piece, you'd like to give that person the opportunity to send you a check, if they so desire," Frederick Bush noted.

Noteworthy Sources

With a "wild guess" figure of about one million fund-raising letters sent under Frederick Bush's direction, the sources of those names and addresses are noteworthy. One of the major sources of names are the state finance chairmen around the country, Bush explained.

Many states have well-developed finance committees as well as several finance organizations within each major

White World Photo

George Bush, exuberant after his triumph over front-runner Ronald Reagan and seven other candidates for the Republican presidential nomination in last week's Iowa Republican straw-poll caucus, gained support from local Republicans with the help of a letter-writing campaign combining word and data processing.

city. "We are constantly asking those people to supply us with names of potential contributors," Bush said.

"When we have a fund-raising event in an area, we try to put together a committee with 20 to 100 members," he added. "Every one of those people is asked to invite maybe 25 people, and to supply us with the names of the people they invite, resulting in a very selective list of potential contributors."

Rented Lists

In addition to such promising possibilities, Bush also rents mailing lists from list brokers.

"Lists may include names of subscribers to *Forbes* magazine, *The Atlantic Monthly, Changing Times*, people who buy steak through the mail or people who gave to a particular cause," he said.

While each list may contain a million names, the risk taken is "enormous" in terms of possible returns, Bush explained. "You wouldn't just go and rent all those million names and mail them, but you might rent only 5,000 or 10,000 names, code the mailing and, if it did well, you might go back and rent more."

Contributors File

Bush also maintains an in-house file of past contributors, stored on floppy disk and presently containing 30,000 names. "That's growing by leaps and bounds every day," Bush noted.

"For example, today we got about 600 new contributors," he said the day after George Bush won the Iowa caucus. "And these are contributors whose money was received through the mail this morning, so there was no chance they would have known that we were going to win the caucus.

"I'm looking for a sizable amount by Monday," he predicted.

Also stored in-house on floppy disk is the list of 150,000 to 200,000 names and addresses gathered from the state finance chairmen and other Republican party people.

Alumni Lists

A fourth method Bush has used draws on alumni from the schools George Bush attended, including Andover Academy in New Hampshire and Yale University. "We've mailed every person who graduated from Yale between 1940 and 1949 an appeal for contributions," he noted, "and now we're working on the 1950s."

Since George Bush's younger brother, Jonathan, also went to Yale, Frederick Bush used Jonathan's class directory as the basis for another list.

"We're constantly doing these kinds of lists," Bush noted. "The more personal you can make it, the better it is."

However, there are drawbacks to such an approach, he noted. "All we know about those people is they graduated from Yale. They could be Democrats, they could be poor, they could be *dead*."

List Cleaning

In an effort to avoid sending letters to the deceased or duplicate letters to the living, Bush "cleans" his lists before sending them out. Using a computer, "you take the list you're going to mail and the list of contributors you have; then you run a 'dupe elimination' to take out the duplicates and the people who've already contributed," he explained.

"That is fairly effective, and it's the only way to clean a list when dealing with large numbers," he noted. With a small list, the computer can output the names alphabetically, to be compared manually with a computer-generated alphabetical list of contributors.

And who composes the letters? "There are many people inputting — I do some of it, we have creative writers and we have direct mail consultants who specialize in this type of thing," Bush said.

"And George Bush personally approves every fund-raising letter," he added.

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Control Room Chaos Cited

DP Failure Not Cause of 'Near-Collision': FAA

By Marguerite Zientara
CW Staff

EULESS, Texas — The failure of an air traffic control (ATC) computer at the Air Route Traffic Control Center (ARTCC) here two months ago "contributed to but did not cause" what was reported as a near-collision in midair between two passenger jets, according to the Federal Aviation Administration (FAA).

And while officials at the time estimated the planes were separated by 600 feet vertically and about one mile horizontally [CW, Dec. 10], investigators have concluded the horizontal separation was actually about three miles, according to Paul Zimmerman, air traffic evaluations specialist for the FAA's Southwest Region.

"The distance was less than the standard separation we allow, but it could not be considered a near midair collision," he noted.

Chaos in Control Room

The relative closeness of the two planes on Nov. 27 actually resulted from chaos in the control room during the transition from computer-generated digitized radar data to broadband radar, Zimmerman said. The confusion was similar to that experienced by controllers at the Leesburg, Va., ARTCC in October, resulting in a true midair near-crash [CW, Nov. 12].

In the Euless center, as at Leesburg, planes were being "handed off" from another ARTCC, in this case Memphis. Because of the transition situation — which involves moving the 400-pound radarscopes from a vertical to a horizontal position and manually writing flight identification data on pieces of paper — controllers lost track of one of the planes involved after giving it clearance to descend for smoother weather, Zimmerman said.

Only when the pilot of the jet queried controllers about turbulence did controllers realize they didn't know exactly where the jet was. After determining the jet's position, controllers directed its pilot to climb to a higher altitude for further separation.

While the original computer failure was remedied after four minutes of downtime, two minutes later a separate software problem caused a 20-second interruption, during which time the incident occurred, Zimmerman said. Because the controllers were in the midst of reorienting themselves when they lost digitized radar again, more confusion ensued.

Backups Requested

In repeated requests for backup ATC computer equipment, air traffic controllers in recent years have consistently cited the confusion following a computer failure as a cause of disorientation with potential for a midair collision.

The FAA sees the situation differently, however. "The controller has a responsibility to separate these aircraft whether he's got the computer or the normal radar, or whether he loses everything and goes to a separation standard that uses no radar at all," Zimmerman noted.

In their investigation report, FAA investigators recommended that a complete review of the incident be undertaken with the personnel involved, that the controllers involved be recertified and subject to a testing period and that they be given special refresher training on making the transition from digitized to broadband radar.

Cause of Failure

The computer failure itself was caused by a storage element malfunction in the radar display channel processor, which is connected to the center's IBM 9020D and 9020E via a channel-to-channel interface, according to a spokesman in the automation section of the FAA's regional office.

That storage element malfunction was traced to an error in a software "patch" developed by the National Aviation Facilities Experimental Center (Nafec) in New Jersey, he said.

Faulty Element

The patch, designed to keep count of operational errors, was instead returning the count to "zero" after each error so that technicians were unaware of the faulty storage element until it "blew," the spokesman explained. The problem was identified immediately after the outage, and the patch was removed, he said.

"Two or three" days later, Nafec engineers hand-carried a correct patch from New Jersey, and the system has been running smoothly since, he added.

As for the 20-second interruption, that too was attributable to a programming problem, the spokesman noted. One of the operational programs normally outputs an I/O Check Report Summary every five minutes, he explained.

"While trying to do that, the program took an incorrect exit out of the subroutine and went into an Element Check Analysis," he said. "It was not an abort, but a startover."

Nafec, which is aware of the problem, is reportedly close to a solution, he added.

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DP Crime Laws Enacted in Only 10 States; Congress Working on 'Model' Federal Bill

By Marguerite Zientara
CW Staff

WASHINGTON, D.C. — To date only 10 states have enacted computer crime legislation. Legislative action is pending in five states and a "model" federal bill is still at the legislative grindstone.

In states without such statutes, U.S. attorneys prosecute computer crimes under laws designed to punish such diverse crimes as mail fraud, wire fraud, theft of trade secrets and obscene telephone calls.

In 1978, Arizona and Florida became the first states to pass laws specifically against computer crime. Arizona's law defines the types of computer crime and specifies whether they are first or second degree.

With no mention of a fine imposed, the Arizona law calls for five years in prison for a first-degree felony conviction and a year and a half in prison for a second-degree felony.

Florida's bill addresses offenses against intellectual property, offenses against computer equipment or supplies and offenses against computer users. Crimes resulting in damages between $200 and $1,000 are considered third-degree felonies, while damages in excess of $1,000 belong to second-degree felony crimes.

Action in Other States

States that passed computer crime bills in 1979 — with varying severities of punishment — include Colorado (whose law was modeled after the Florida bill), Illinois (where types of crime range from a misdemeanor to a Class 4 felony), Michigan (where infractions are punishable by up to 10 years in prison and/or a $5,000 fine) and New Mexico (where third-degree felony is defined as a crime resulting in damages over $2,500).

North Carolina passed a bill last year that categorizes the altering, damaging or destruction of a software program, system or network as a misdemeanor. This bill also levies a felony punishment on verbal or written communications intended to extort money through a network.

Utah passed a crime bill with four classes of offense. For fraudulent acts resulting in damages greater than $25 but less than or equal to $100, the charge is a Class B misdemeanor. If the damages exceed $100 but are less than or equal to $300, the charge becomes a Class A misdemeanor.

For damages between $500 and $1,000, the charge is third-degree felony; for damages greater than $1,000, the crime becomes a second-degree felony.

Last year, too, Rhode Island and California passed similar computer crime legislation, with California even adding an amendment to include programmable pocket calculators.

The California bill, and hence the Rhode Island bill, was based on a federal computer crime bill introduced by Sen. Abraham Ribicoff (D-Conn.).

Although Ribicoff's bill was recently approved by the Senate Subcommittee on Criminal Justice, it is questionable whether it will be passed this year, according to a Ribicoff aide. It is hoped, however, that the bill will serve as a model for remaining states to initiate their own computer crime legislation.

A number of other states have introduced computer crime bills that have met various legislative fates. Hawaii, Minnesota and Missouri have carried their computer crime bills over to 1980, with action pending.

Maryland's bill, introduced last August, is currently dead but may be brought up again this year. In Massachusetts, a bill relating to computer privacy is being revamped, and Tennessee killed a computer crime bill last August.

Future Systems Focus of Meet

PHOENIX — The future of large-scale system architecture, communications networks and the information systems marketplace will be the focus of a three-day conference to be held on March 3-5 in Scottsdale, Ariz.

Organized by Advanced Computer Techniques Corp. (ACT) the Future Systems Forum will include a session on IBM's H-series, led by Robert T. Fertig, ACT's president of the Technology Analysis Group.

Known throughout the industry as a dedicated IBM watcher, Fertig will explore what performance/price standards can be expected from the H-series; how IBM intends to protect, grow and maintain control over its customer base; and what design and technology can be expected from the computer giant.

A significant portion of Fertig's presentation will discuss how coming technological changes will affect DP management, a spokeswoman explained.

The sessions will also feature a number of speakers from NCR Corp., Univac and Honeywell, Inc. who will present competitor views on large-scale systems in the '80s. In addition, the forum will examine the current status of Satellite Business Systems and AT&T's Advanced Communications Service, with views presented by representatives from both companies, the spokeswoman said.

Registration fees for the forum are $650, or $585 for those who sign on before the end of January. However, all registrations must be received by Feb. 28, ACT noted from Suite 101, 222 N. Central, Phoenix, Ariz. 85004.

Parker to Address HP Users

SAN JOSE, Calif. — Computer security expert Donn B. Parker will be the keynote speaker at the ninth annual conference of the Hewlett-Packard Co. General System Users Group, slated to be held here on Feb. 25-29.

Parker, author of *Crime by Computer* and member of SRI International, Inc., a non-profit research organization, will address the second day of the five-day meeting and discuss computer abuses in U.S. business and government using numerous case descriptions.

Attendance at the conference is expected to exceed 1,000, and the meeting will feature more than 100 technical sessions in such areas as data base management, language use, data communications and distributed data processing, a spokesman said.

The registration fee for the event is $240 at the door. Additional conference information can be obtained from Carol Taylor at (301) 768-4187.

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Cache Possibly Worth $40,000

California Police Uncover Chip Theft Operation

By Jeffry Beeler
CW West Coast Bureau

SUNNYVALE, Calif. — Police may have uncovered a major chip-stealing operation earlier this month when they allegedly found an estimated $40,000 worth of contraband components at the home of a Silicon Valley electronics dealer.

The discovery here of several hundred apparently stolen chips has led to the arrest of John Jackson, owner of the Santa Clara, Calif.-based Dyno Electronics Store. Jackson, 41, was arrested on suspicion of receiving stolen property and placed in the Santa Clara County Jail in nearby San Jose.

Local investigators still don't know exactly how or from whom Jackson allegedly obtained his cache of stolen computer memory and processor chips. Nor do they know exactly how he intended to dispose of the devices. But after reviewing all the evidence gathered in the case thus far, area investigators do suspect Jackson's alleged chip heist may not have been his first, according to Det. Wayne Brown of the Santa Clara County Organized Crime Unit. In fact, some police here claim to have linked Jackson to a long series of black market chip dealings dating as far back as 18 months ago, Brown said.

Anonymous Tips

Authorities here first learned of Jackson's alleged chip theft after receiving a series of anonymous phone tips, according to a local industry source who asked not to be identified. The first call offered investigators few concrete details, but the second claimed the suspect was planning a secret shipment of some 4,000 Intel Corp. 2716 and 2732 memory chips to Los Angeles.

Investigators took the tip seriously because it coincided with Intel's recent reports that some of its 2732s were mysteriously missing.

With the help of the county's Organized Crime Unit, authorities were able to corroborate enough of their anonymous tipster's information to obtain a warrant to search Jackson's house here, the source said.

Chips, Components

Once inside the dwelling, Santa Clara County Sheriff's detectives and other investigators reportedly found an undisclosed number of Intel 2716s and 2732s as well as some Intel 8748 processor chips.

They also allegedly found an assortment of components from other suppliers, including National Semiconductor Corp., Signetics Corp. and Texas Instruments, Inc.

Cosmetic Rejects

Industry experts were then summoned to examine the recovered chips, and most were identified as "cosmetic rejects," components that are usually perfectly functional but that fail final inspection because of some minor defect in their appearance.

The discovery of cosmetic rejects circulating in the open market virtually ensures the chips were stolen, the source said. Rather than sell their rejects, most semiconductor companies prefer to recycle the devices and recover their gold content.

Traffic in black market microcircuits has become an object of growing concern to semiconductor firms during recent years. Most observers of the integrated circuit market blame the problem on an acute semiconductor shortage caused by the industry's continuing inability to meet growing customer demand for its products.

Efforts to stem the bustling trade in stolen chips have proved only partially successful, mainly because of the huge volume of integrated circuits produced each year and because of the large number of steps involved in fabricating them.

The more complex a chip is to produce, the greater its vulnerability to pilfering.

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Manager–Corporate Property Accounting
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Button Contest Finds TV, Sex on DPers' Minds

By Tom Henkel
CW Staff

FRAMINGHAM, Mass. — Television sitcoms and sex seem to be the things most on DPers' minds — at least when it comes to creating clever slogans for CW Communications, Inc.'s first annual button contest.

Screened through CW's arduous selection process — somewhere between that of the Miss America Pageant and pin-the-tail-on-the-donkey — several hundred entries were recently narrowed down to six lucky winners.

The winning slogans were "Kiss My Bits," submitted by J. Howard Carmichael of Allen Services Corp., Indianapolis; "Nano Nano" by Jan Thompson, Hughes Aircraft Co. in Los Angeles; "Hard Where?" by Tom Cramer, Concord, Calif.; "Equal Bytes for Women" by C. Barnard of Medicus Systems, Chicago; "I/O Everybody" by Jack Andrews, Dallas; and "The Agony of Delete" by Mike Marconi, Austintown, Ohio.

Those winners will receive a hand-held computer game, which CW Communications promises will be worth less than $100.

Winners will also receive a certificate of merit attesting to their "exceptional wit and cleverness," according to CW Vice-President for Research Jack Edmonston.

Runners-up in the contest were "Batch, Batch, Batch, That's All You Ever Do" by Linie Moore, Basic Four Corp., Tustin, Calif.; "Semiconductors Are Only in Charge of the Woodwinds" by Candace Wilmont, University of Illinois, Chicago; "Ma Bell Is a Carrier" by S.L. Olson, AT&T, Kansas City, Mo.; "Miss Piggy Prefers Programmers" by Susan Field, NLT, Blue Bell, Pa.; and "What Did Itel You" by Charles Stevenson, University of California at Berkeley.

For the 38 other people who submitted "Kiss My Bits" and the 14 other people who submitted "Nano Nano," CW was sorry, but there could only be one computer game winner for each button. The winning entry was randomly selected by CW's Vice President of Editorial, E. Drake Lundell Jr. And randomness, Edmonston said, is Lundell's true calling.

Bob Cook, Medicus Systems, Chicago, who submitted the only duplicate entry for "Hard Where?", had a 50-50 chance, but wound up in the wrong 50.

All coentrants of winning slogans, however, will receive the coveted certificate of merit, Edmonston said.

The button entries were narrowed down to 20 semifinalists by an arbitrary panel of judges. The semifinalists were then voted on by *Computerworld's* editorial department, promotion department and salesmen.

Several hundred people entered the contest, many with more than one slogan. This is the first year CW button slogans were chosen by contest. Previously, the slogans were dreamed up in-house.

Coentrants of winning slogans who will receive certificates of merit are:

For "Kiss My Bits" — Ruth R. Ouzts, Parke Davis, Greenwood, S.C.; Anna L. Elliott, Digital Equipment Corp., Merrimack, N.H.; Ann Peoples, Integon Corp., Winston-Salem, N.C.; A. L. Hoeckele, Stone Mountain, Ga.; Joel Holback Jr., Comac, Inc., Oklahoma City, Okla.; C. Wayne Miller, Space Age Computer Systems, Lexington, Ky.; Kathy Hackett, Federated Department Stores, Cincinnati; David M. Dickler, Boca Raton, Fla.; Dr. Gerald N. Pitts, Mississippi State University at Mississippi State; Don Smith, Wyle Laboratories, Huntsville, Ala.; and Wayne Walker, GTE Data Services, Durham, N.C.

Also, Tom Ruggiero, Brosius-Eliason Co., Newcastle, Del.; John Sunday, American Management Systems, Arlington, Va.; Martin Katz, Cheeseborough-Pond's, Inc., Norwalk, Conn.; S. Ames Smith, Bank of Mississippi at Tupelo; M. J. Lindholm, Los Alamos, N.M.; Jerry Best, Phillips Fibers Corp., Greenville, Tenn.; Betsy Davis, Institute for Law and Social Research, Washington, D.C.; and Carol H. Perkins, Pacific Power Equipment, Burlingame, Calif.

Also, Wayne Griffin, Branch Banking and Trust Co., Wilson, N.C.; J. Daniel Buelter, Capital Development Boards, Springfield, Ill.; David R. Cornwell, Country Club Hills, Ill.; Robert Steele, Mother Care, Inc., New York; Donn Thornhill, The Treaty Co., Greenville, Ohio; R. Barry Chalfin, Andover, Mass.; Michael K. Tilford, Marshall, Va.; Robert Dombroski, Univac, Blue Bell, Pa.; David Hammett, Buzzard's Roost, Odenville, Ala.; J. J. Parent, Bethlehem Steel Corp., Chesterton, Ind.; Ken Preissler, Hobart Corp., Troy, Ohio; Stanley Perlin, Cantor Fitzgerald, Rockaway Park, N.Y.; S. M. Dahlheimer, Borg-Warner, York, Pa.; P.A. Miscione, Trust Co. of N.Y., New York; Lois Napolis, Datatel Minicomputer Co., Washington, D.C.; Lennox Myrie, Cambria Heights, New York; Peter D. Senzon, Standard Brands, Inc. New York; and Martin Bly, First National Bank and Trust, Cheyenne, Wyo.

For "Nano Nano" — Jean Calvert, Wilton Coombs and Colnett, Inc. Advertising, San Francisco; J.S. DeMeo, Bethlehem Steel Corp., Chesterton, Ind.; Mark Young, Tulsa, Okla.; Les Resnick, Office of the Comptroller, New York; Doug Staite, Hawthorne Machine, San Diego; Manny Pena, Logicomsa, Guatamala City, Guatamala; Janis Voorhees, University of Maryland, Columbia, Md.; Harold L. Bearce, Topeka, Kan.; Bernard N. Lynch, Harris Trust and Savings, Chicago, Ill.; Linda Bose, Eaton Corp, Kenosha, Wis.; Dick Bradner, Parma, Ohio; Dina Wallace, USAF-ACBAB, McClellan AFB, Sacramento, Calif.; Jim Mulford, International Computing Co., Dayton, Ohio; and John Piper, AT&T, Kansas City, Miss.

For "Hard Where?" — Bob Cook, Medicus Systems, Chicago.

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FUTURE SYSTEMS FORUM II

1980's SCENARIOS FOR THE IBM H SERIES AND OTHER LARGE SCALE SYSTEMS, SOFTWARE, TELE-COMMUNICATIONS, AND OFFICE AUTOMATION.

Which vendor? Which product? Upgrade? Purchase or lease?...These are the kinds of decisions awaiting you at the dawn of the 1980's. But on March 3rd, 4th and 5th, 1980 you can prepare for them at FUTURE SYSTEMS FORUM II in Scottsdale, Arizona.

FUTURE SYSTEMS FORUM II presents another in depth program to analyze and forecast new products, new software and services and new technologies for the 80's. You will hear top speakers representing some of the leading large scale manufacturers and users from diverse industries. Companies like Exxon, GE, IBM, Motorola, Nippon Electric, Texas Instruments, Satellite Business Systems and Electronic Data Systems, among others.

You'll get a wide range of vital information and projections on the 80's. The kind of accurate forecasting heard at last year's Forum, such as 303x pricing, IBM's Newport series and memory price trends.

FORUM II's agenda includes crucial topics and issues, particularly the anticipated IBM H series, software trends, telecommunications and office automation, their impact on the information systems industry, competitors and users.

MONDAY, MARCH 3

Charles P. Lecht, *President Advanced Computer Techniques and author of "The Waves of Change"*
Keynote Speaker. "The Next Twenty Years of Computer and Communications Technology."

Since "The Waves of Change" was first published in 1978, the rate of change in this industry has, in fact, accelerated. Mr. Lecht will explore the immense and varied possibilities for the Information Systems industry which technology may make possible by the turn of the century. E. G. VLSI, Josephson's Junction, bubbles, intelligent panel displays, fiber-optics, etc.

Conventional assessments of the data processing industry, preferred by industry spokesmen whose bases are well established, tell us that it is in an *evolutionary phase* — an orderly transition of some kind. Mr. Lecht maintains, "nothing could be further from the truth. A *revolution* in the way we produce, acquire and use electronic computer and communications technology is brewing, and it will result in change the magnitude of which will swamp what has thus far occurred. We are beginning 'A Great Transition' to a new era where computer and communications technology will represent a driving force for a new and beneficial industrial revolution."

Technology for the 80's:

Ian Le Mair, *Manager of Strategic Marketing (Microprocessors) Motorola, Inc.*
"The MC68000 – The Effect of High Performance Microprocessors on Computer Systems in the 80's." The combination of the microprocessor in computer architecture plus the challenge of making VLSI technology real have given birth to a new generation of microprocessors that will challenge traditional mainframes of the 1980's. The features of MC68000 and the implications of VLSI on computer systems will be discussed.

Dr. Egil Juliussen, *Senior Member Technical Staff, Texas Instruments Corporation and* **Dr. Portia Isaacson,** *Vice President EDS Business & Educational Series Corporation*
"Future Computing." Trends in hardware technology: memories, mass storage, processors, communications, applications: small business systems, information distribution; software: pricing, future languages, distribution, service/maintenance: remote diagnostics, manufacturers service, built-in testing; impacts of future technology on corporate DP.

Paul Quantz, *Manager, Computer Aided Engineering and Manufacturing Council, General Electric Company*
"The Computer Invasion of Engineering & Manufacturing." The implications of computer aided design and manufacturing on future system architecture, data management and control, software applications, software design, user interface design.

Dr. George Champine, *Vice President, Research & Product Development, Vydec, Exxon Corporation*
"The Database Processor of the Future." Database processors are specialized information processing systems tailored for information storage and retrieval. This technology is moving out of the research phase and should be in the marketplace within three years. The various approaches being pursued in database processors and the advantages and disadvantages of each will be reviewed.

Panel Discussion led by **Thor Thoresen,** *Vice President, ACT Corporation.*

Software Productivity Tools & Applications Requirements in the 80's:

Art Benjamin, *President, Art Benjamin Associates Ltd.*
What are the most significant obstacles to higher productivity in application design and development? An examination of systems architecture based on realistic concept of the "system cycle." How such an architecture can solve the major problems of development productivity and application usability.

A Japanese View of the U.S. Computer Market:

Dr. Hiromu Kaneda, *Senior Vice President, Nippon Electric Company*
Differences between Japanese and American markets; NEC's view of IBM and other U.S. competitors; the future of NEC in U.S. computer market; NEC's assessment of its own strengths as a competitor; experiences to date.

Communications Networks and Services for the 80's:

James W. Patty, *Assistant Director, Marketing Support Programs, Satellite Business Systems*
"An overview of SBS and its planned services." The current status of SBS; planned milestones; an overview of the SBS system and its features; applications and benefits of the SBS service.

AT&T (speaker to be announced)

Forum Discussion
Cocktails

TUESDAY, MARCH 4

IBM H-Series Forecast, 1980-84:

Robert T. Fertig, *President, Technology Analysis Group, ACT Corporation*
What are some of the market forces at play in the "Information Systems" marketplace? Has Grosch's law been killed or will it awake again in the 1980's? What new performance/price "standards" can we expect from the H Series and when? How can IBM protect, grow and maintain control over its customer base during the transition to systems in the 80's? What changes in large scale system architecture, design and technology can be expected from IBM and how will this impact EDP management?

Competitor Views on Large-Scale Systems for the 80's:

Fred W. Bauer, *Director, NCR Corporation, "Design for Growth"*

John Selman, *Manager, Market Analysis Services, Honeywell Information Systems*
"Large scale systems for the 80's: The users' outlook as Honeywell views it."

Neil Gorchow, *Vice President, Sperry Univac*
"Large scale systems trends for the 80's."

How will the other major computer manufacturers maintain and improve their competitive posture in the 1980's? What changes in systems architecture, design and technology can be expected during this period and how will this impact DP management? Will the operating systems, and other software developments keep pace with the likely improvements in hardware? Will distributed processing and network nodes subtract from or add to the demand for more powerful host processors? How will the mainframe companies address the key issues of programmer and applications' productivity, and rising maintenance costs and shortage of skilled programmers/analysts.

Prospects for the Evolution of Large-Scale Systems in the 80's:

IBM *(speaker to be announced)*
What are some of the realistic expectations on the future of large scale systems and their effect on the data processing industry in the next decade. What are the trade-offs between small scale systems and distributed processing versus large scale products? How can management plan for an orderly transition to take advantage of the new technologies (hardware and software in the 80's)?

Industry Outlook: The Wall Street View:

Dr. Ulric Weil, *Vice President, EDP Research, Morgan Stanley, Inc.*
"The Demand Bubble." Anticipated major new product announcements; end user expenditure patterns; data processing demand; the E and H series; impact on competitors and their options; pricing as a competitive tool; IBM's current business strategy.

Office Automation: Current Experiences and Future Direction:

Dr. George Champine, *Vice President, Vydec, Exxon Corporation*
"The Integration of Word and Data Processing Within the Corporate MIS Function." Word processing and text processing systems have mechanized many of the document generation functions previously performed manually with the typewriter. The next logical step is to integrate the word and text processing subsystems into the overall corporate information system. The future roles that word and text processing subsystems can play in integrated information systems along with the functional division of activity between the work station and the main frame.

George Potter, *Director, Sales Promotion — Office Automation, WANG*
The direction of the office automation market; the integration of word and data processing; the role of office automation and electronic mail; how office automation can improve office productivity.

Panel Discussion led by **John Phillips,** *Executive Vice President, ACT Corporation*

Cocktails

WEDNESDAY, MARCH 5

The Great Transition – A Special video film Report:

Herman Kahn, *Director & Chairman, The Hudson Institute and author of The World Economic Development.*
The reports describe a phenomenon known as "The Great Transition" – a 400 year period beginning with the industrial revolution, which, providing technology and the economy are properly managed, should see mankind moved into a more affluent and prosperous world in the next two decades.

Strategic Planning for Distributed Processing in the 80's:

Hal B. Becker, *Manager, Distributed Systems and Networking, ACT Corporation*
Are current information system strategies consistent with observed management philosophies? How fast is dependence on automated information management growing? What direction and rate of change is perceived in the user community? Do the emerging distributed technologies offer workable, cost justified solutions to all users?

User Views on Challenges & Opportunities for Information Systems of the 80's:

Presentations and panel discussion including the following companies: **ITT, Hughes, General Host, Exxon and others.**

Key issues and discussion areas:
- IBM 4300 experiences to date
- User views on competitive posture of IBM 4300
- User challenges in the use of new technologies
- Need to determine the proper level of distributed processing while maintaining data integrity & control
- Technology forecasting
- Other challenges & opportunities in the 80's.

NOTE: Program and speakers subject to change.

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Contract Ploys Suggested for Users

By Brad Schultz
CW Staff

NEW YORK — There are at least two sides to every contract negotiation, and attorney Paul J. Ostling suggested to attendees at the recent National Retail Merchants Association convention here some ploys the user can use against DP vendors in reaching a purchase agreement.

"Create a disparity of knowledge" in starting negotiations for a systems purchase, Ostling recommended. The user should not appear especially sophisticated from a technical standpoint, instead, the seller should be pressured to devise a system appropriate for the applications at hand.

"You do this by buying a black box," Ostling said. In the request for proposals — which all users should employ in looking for a system to buy — emphasis should be placed on the applications rather than specific technical constraints.

In short, the user should specify what the system should do and let the seller specify how the system will do it.

Should litigation ever result, Ostling explained, the user's case would be simpler to present and the vendor could not easily insinuate that its system failed to meet the user's needs because the user failed to specify those needs correctly.

Detailed Accounting

Another strategy for users is to demand from the vendor a detailed accounting of the implementation process, Ostling said. The vendor should report to the user at regular intervals on exactly what progress, if any, is made toward the objectives identified in the contract.

The contract should therefore outline the schedule the vendor must meet to satisfactorily install the system and make it operational. If possible, the attorney said, penalties for failure to meet the schedule should be specified in the agreement.

However, most vendors will not agree to such a condition in the negotiations, he observed.

By this strategy, the vendor would regularly declare how much money and time it spends and identify any problems along the line. Should litigation come about, the user's case would be simpler to present and the vendor would find it more difficult to escape liability, Ostling suggested.

Magic Phrase

If at all possible, users should insert the phrase "time is of the essence" in discussing the matter of implementation. Courts would then hold the vendor liable for "reasonable compliance" with that stipulation, according to the Arthur Young & Co. counsel.

The user should also try to incorporate in the contract as much as possible of the "paperwork" exchanged between it and the vendor during the negotiations, Ostling added. Systems sellers sometimes contrive an agreement that voids any verbal or written assurances made prior to the document's signing.

As a result, the final contract often does not mention certain conditions the user expects to be fulfilled. Those conditions may go unfulfilled, Ostling warned.

Hence, the contract should cite all conditions demanded by the user. Otherwise, the user may not have sufficient evidence to support a claim in court that the conditions were ever agreed upon.

Performance Bond

Finally, Ostling suggested that the user consider asking the vendor to buy a performance bond in the user's name. Such bonds are sold by insurance companies and financial institutions as a hedge against contract squabbles.

The price of the bond can be added to the system purchase price. The bond would offset some of the user's losses in the event of a bust.

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FRAMINGHAM, Mass. — MIS Associates will conduct three-day seminars in four cities between now and July on "Auditing and Security Concepts for IBM's MVS Operating System" and "Audit and Control of Data Base Systems."

"Auditing MVS" will be held in San Francisco March 26-28, Chicago April 16-18, Houston May 28-30 and Boston July 16-18. Designed for those responsible for auditing an IBM MVS installation, the seminar will focus on design philosophy, specific facilities and security features.

"Audit and Control" will provide a practical working knowldge about internal control, audit responsibilities and data integrity for DP business systems utilizing data base design technology.

"Audit and Control" is scheduled for San Francisco March 19-21, Chicago April 21-23, Houston June 2-4 and Boston July 21-23.

Each three-day session will cost $465. More information is available from MIS Associates, 12 Juniper Lane, Framingham, Mass. 01701.

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Lovell to Open Okla. Conference

OKLAHOMA CITY, Okla. — Former astronaut Capt. James A. Lovell, now president of Fisk Telephone Systems in Houston, will be the keynote speaker at the Southwest Computer Conference to be held here March 25-27.

Sponsored by Oklahoma City University in cooperation with the Association for Computing Machinery, the conference will include 200 exhibit booths and 60 seminar presentations.

There will be a one-day registration fee of $50 and a three-day fee of $85 for the conference.

Information and registration forms are available from E.Z. Million, Conference Director, Southwest Computer Conference, P.O. Box 950, Norman, Okla. 73070.

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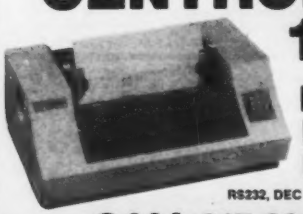

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Beware of 'Mined' Contracts, Attorney Warns

By Brad Schultz
CW Staff

NEW YORK — Many agreements users sign are "land-mined" by vendor legal counselors, attorney Paul J. Ostling told retail DP managers here recently.

The so-called mines are contractual loopholes that allow vendors to minimize or even escape liability in the event their systems fail to perform as expected by the user, Ostling explained.

"Those mines are meant for you to step on," the associate general counsel of Arthur Young & Co. cautioned. Ostling regularly represents that accounting firm, which offers DP consulting services, in contract negotiations and litigation.

At the meeting of the National Retail Merchants Association, however, Ostling turned the tables and told retailers how they can spot land mines planted by seller representatives like him and fight to have them removed before consummating any agreement.

In discussing procurement negotiation, Ostling did not say that most vendor attorneys are dishonest or that most user contracts are "setups" for exploitation. Instead, he suggested that vendors' lawyers are often better prepared than users' lawyers to negotiate contracts for DP purchases and the former are, after all, retained to maximize protection for their clients.

Hence, the burden falls on users to get better legal protection, Ostling indicated.

In any event, the law does not permit sellers to misrepresent their products — that is, claim the products have capabilities they actually do not have. According to Ostling, sellers can even be prosecuted for "innocent fraud" — supplying systems that do not meet the user's performance requirements as set forth in the contract, although the vendor sincerely thought they would.

Overselling Common

In beginning his talk, Ostling observed that "if you're happy with your system, you've probably been oversold." Too many users buy more performance and capabilities than their applications and rate of growth warrant.

This may result from high-pressure salesmanship, but may also reflect a lack of prudence on the part of the user's buying agents, he said.

On the other hand, users commonly experience some degree of disappointment with newly installed facilities, Ostling pointed out. Sometimes that is because the purchases do not perform as expected — a situation that may provoke litigation. At other times, however, it turns out that the user's expectations were unrealistic — perhaps because the user's needs analysis was faulty.

Needs Analysis

Prior to soliciting vendors, the user should have a comprehensive needs analysis performed by technical experts who will not themselves be using the facilities procured. If the experts have a stake in the purchase or its consequences, they will tend to overbuy, Ostling said.

A facilities upgrade generally enhances the political clout and prestige of facilities personnel and those who manage them, the attorney explained. Hence, a user organization's own technical staff and DP management often have incentive to advocate excessive procurements.

When it comes to soliciting, the private sector should follow the examples set by the public sector and draft formal requests for proposal (RFP), Ostling continued. Firms should make their needs specifications, as determined in the needs analysis phase, known in the RFP and secure a reasonable number of bids from vendors that claim they can meet those needs.

The process of evaluating RFP responses culminates in awarding the deal to a particular vendor. Then comes negotiation of the contract and the planting of land mines, Ostling noted.

The 'Mines'

The attorney urged users to beware of the following common vendor ploys in reviewing a prospective contract. In practice, the wording within a contract that perpetrates these ploys is not identified by the legal terms used below, Ostling said, and it may be both grammatically and typographically difficult to read.

- *Integration clause.* Although user needs may change after the equipment is delivered, this clause limits the vendor's obligation to adapt to those changed needs.
- *Exculpatory clause.* This limits the vendor's liability for damages that might result from the system not performing as promised.
- *Waiver of warranties.* Although software is seldom warranteed well, Ostling said, users should draft their own warranties and bear in mind that "products must fit the purpose for which they are sold" under the Uniform Commercial Code.
- *Indemnification clause.* Similar to an exculpatory clause, this specifies the maximum amount of money a vendor might lose in litigation for breach of contract or misrepresentation.

The user should have its legal counsel inspect any significant purchase agreement for these ploys before the document is signed, Ostling said. The document should be legibly printed; tiny or unclear text should be retyped.

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Justice to Study INS DP Practices, Management

By Jake Kirchner
CW Washington Bureau

WASHINGTON, D.C. — The use, and alleged misuse, of information systems by the Immigration and Naturalization Service (INS) will be the subject of an in-depth management study, the Department of Justice said last week.

In announcing the study, Attorney General Benjamin R. Civiletti noted recently that Congress has become increasingly concerned over the last year with INS problems in automating its extensive recordkeeping activities on aliens in this country.

Civiletti said INS automation requirements "attest to a need which I and others have identified as critical and which [are] among my priority concerns for the department."

INS plans to procure minicomputer systems for its field offices were halted by Congress last summer when it was learned the agency did not have authorization to buy the hardware and that the automation project was not considered completely successful by Congressional investigators [CW, Aug. 6].

Congress subsequently authorized the Justice Department, INS's parent agency, to undertake a thorough management study of INS information systems and management practices and policies in general.

Announced last week, the study will be directed by John Kratzke, assistant managing director of the Interstate Commerce Commission. The President's Management Improvement Council, a program initiated last September to use federal officials to improve the management and performance of federal agencies, will oversee the study.

Two Phases

The first phase of the project, expected to take six months, will concentrate on INS information systems, records and automation, the Justice Department said. A second phase, which may take up to a year, will address general management concerns such as organizational structure, planning, personnel practices and auditing policies and procedures.

According to Edward H. Chase, Kratzke's assistant in the study, the project team will first spend several weeks interviewing representatives of Congressional committees and the General Accounting Office (GAO) who have expressed concern about INS automation plans and practices.

One body that figures to be prominent in this initial effort is the House Subcommittee on Government Information and Individual Rights, which has jurisdiction over INS DP use and asked that its minicomputer program be delayed pending an investigation.

Separate Study

The subcommittee, with the aid of the GAO, will complete in the next week or two its own study of INS information systems to be released in the form of a report, a subcommittee staff member said. The subcommittee has no plans to unfreeze the minicomputer project any time soon, the aide added.

According to Chase, a program analyst with the Office of Management and Budget's Management Improvement and Evaluation Division, "Our particular job is to try to go in and examine what [INS has] done so far, see if they're on the right track and should proceed or what adjustment should be made."

Chase said the study group will be reporting to the Justice Department and Congress periodically as the project progresses and make recommendations for immediate remedial action.

"We're not trying to place blame," he added, "but only to see what is the problem, if there is any, and what it will take to fix it."

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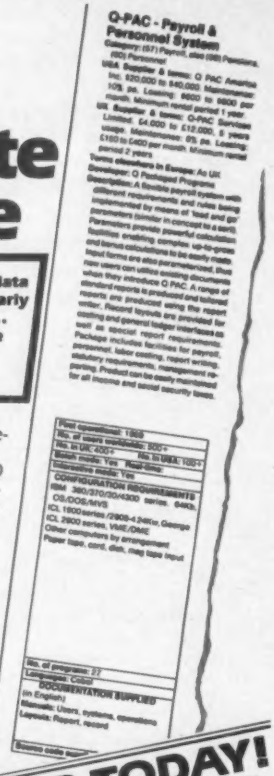

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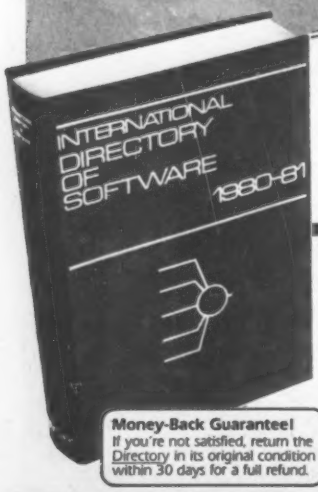

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WALTHAM, Mass. — EDP Security, Inc. is offering a series of three-day disaster recovery workshops scheduled to be held in Boston on Feb. 6-8, San Francisco on Feb. 20-22, Washington, D.C., on March 24-26, and Orlando, Fla., on April 14-16.

Stressing a hands-on practical approach, the courses will cover the design, testing and maintenance of a corporate disaster recovery plan. Case studies and individualized student attention will supplement workshop materials, giving each course member the basics of developing a personalized DP disaster strategy, a spokesman stated.

Students will be taught how to perform a risk cost analysis, prioritize critical applications and files, structure the disaster team, select alternatives for backup computer processing, develop recovery plans and simulate and test disaster recovery blueprints, he added.

The workshop costs $495. EDP Security is located at 400-2 Totten Pond Road, Waltham, Mass. 02154.

'Well, Ethel, I Finally Found a Way to Keep Track of the Kids.'

Haase Retiring, Tozzi Takes Reins

OMB Unites Regulatory, Policy Branches

By Jake Kirchner
CW Washington Bureau

WASHINGTON, D.C. — Recognizing that federal programs cannot be planned and managed without careful consideration of the information resources needed to carry them out, the Carter Administration is merging its regulatory and information systems policy branches into one unit.

The Office of Management and Budget (OMB) Information Systems Policy Division, responsible for overseeing federal data processing and telecommunications, will soon be under the same roof as the OMB Regulatory Policy and Reports Management Division.

The merging of the two divisions into a new Office of Regulatory and Information Policy reflects "a consensus of feeling ... that the government and the private sector should begin looking at the management of information in a different way than it traditionally has," according to Walter Haase, head of the Information Systems Policy Division.

There is "a growing recognition of the costs associated with paperwork [and] the burden of regulatory processes that are imposed on the private sector and the interrelationships between reports management, paperwork burden, regulatory processes and information management," Haase said.

The reorganization is "an attempt to bring these together as a cohesive whole rather than to look at one aspect in isolation of the rest."

Now "the whole spectrum of activities will be looked at at the same time," according to Jim Tozzi, slated to head the new organization. The idea is no longer to "independently take a position on a regulatory action without seeing the information" resources needed to implement it.

Tozzi and Haase emphasized that the reorganization does not mean any downgrading of the information policy activities under OMB's congressional mandate to direct federal DP and telecommunications activities, annual expenditures for which now go as high as $20 billion, according to some estimates.

The several policy groups brought under the new Regulatory and Information Policy Office will continue to exercise their respective policymaking responsibilities, but will also work more closely with one another.

The new office should be in place by the end of this month, according to Tozzi, currently chief of the OMB Environment Branch. Tozzi, who becomes assistant director of OMB for regulatory and information policy, holds a Ph.D. in economics and has experience as a computer programmer and systems analyst.

Haase Retiring

No replacement has yet been named for Haase, who is retiring this month after 12 years with OMB, eight of those in the information policy area.

Haase, who directed the automation of both the White House executive office and the federal budget process, said he has no immediate plans but will seek another position, possibly in private industry, after "taking a little bit of time to relax and reflect and think about what direction I want to move in."

A central figure in federal DP for many years, Haase said that under his stewardship the OMB Information Systems Policy division has "provided a more positive direction to some of the [government] information processing activities that were fairly severly criticized in the early and middle '70s.

"We have put together and demonstrated how information technology can be used to increase the productivity of the government work force and improve the management of agencies and reduce the overall costs of government by substituting technology for heavily labor-intensive activities...

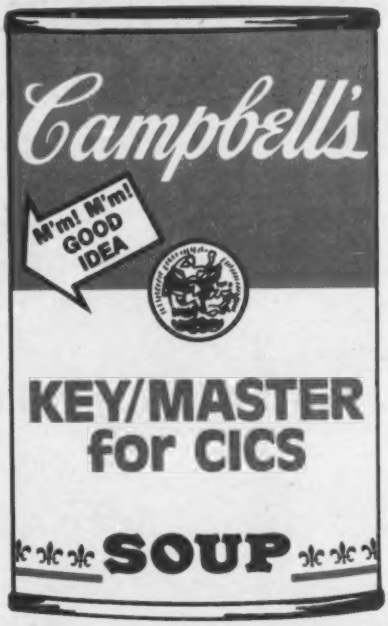
"There's been hundreds of millions of dollars in cost avoidance of these applications, and there's been avoidance of the need to hire thousands of additional people that would otherwise have been needed to carry out the increasing work load of government through purely manual methods.

"We have changed the budget process for information processing to place more of an emphasis on the end benefits and results to be achieved as a result of applying technology rather than looking at technology as an end unto itself."

Haase is particularly proud of the automation of the budget process "from a manual one to one that is totally dependent on the use of the computer" and the establishment of the federal computer security program.

"We've had many inquiries from other countries in regard to the program we're establishing," he said, "as well as from many private-sector firms who are also having their share of problems in regard to computer crime and have expressed a very deep interest."

One of the first tasks to be taken up by Haase's successor will be to finalize establishment of a federation of information processing councils that already exist or are under development on a regional basis around the country.



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Notes Chart Eniac's Birth

Mauchly Works Going to University of Pa.

By Jake Kirchner
CW Washington Bureau

AMBLER, Pa. — When computer pioneer Dr. John W. Mauchly died earlier this month, he was completing arrangements to turn over to the University of Pennsylvania all of his personal notes and papers, including extensive material on the design and construction of the first digital computers.

According to his associates, Mauchly's wife Kathleen will soon sign the papers needed to designate the university's Van Pelt Library as the official archive of the Mauchly papers.

A memorial fund has been established at the library, which is soliciting donations to begin the lengthy process of sorting and indexing the collection.

The memorial fund will eventually seek a grant, perhaps from the National Science Foundation or the National Endowment for the Humanities, to support research projects based on the Mauchly papers after they have been gathered into a workable archive, according to William P. LaPlant Jr. An Air Force computer specialist, LaPlant has been assisting the Mauchly family in establishing the archive.

In the meantime, however, the collection will require as many as four years of organizing at a cost of several hundred thousand dollars, LaPlant said. It is hoped corporate donations will defray most of these initial expenses.

LaPlant, a member of the History of Computing Committee of the American Federation of Information Processing Societies, which has also been backing the Mauchly archive effort, estimated there are hundreds of thousands of pages of Mauchly documents presently stored in the scientist's home here.

"The value of John's papers is that John was an accumulator," LaPlant said. "John saved everything he ever did." Detailed notes on the design and basic computing concepts embodied in the Eniac and Binac computers are "explained in great, gory, elementary detail" in the Mauchly papers, he said.

He added that Mauchly's extensive, lifelong work in the application of computers to weather prediction is also covered in the archive.

Donations Sought

So far, the memorial fund has not solicited donations in earnest, but work on the archive can begin as soon as money starts becoming available.

LaPlant suggested that if "every company that owes its existence to the Mauchly-Eckert invention" were to donate $1,000, assuring the future of the Mauchly papers as a functional archive.

Donations can be made to the John Mauchly Memorial, Van Pelt Library, University of Pennsylvania, 3420 Walnut St., Philadelphia, Pa. 19104.

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International Treaty on Data Protection, Privacy

By G. Russell Pipe
Special to CW

AMSTERDAM, Holland — The Organization for Economic Cooperation and Development (OECD) draft treaty for data protection and privacy approved by national experts last June began to unravel at a September meeting intended to prepare the accompanying explanatory memorandum. By mid-November, hope of reaching an agreement collapsed.

As a result, the Committee on Science and Technology Policy, which has jurisdiction over the drafting project, discharged the experts and sent the disputed text to the Council of Ministers, where its fate is uncertain [CW, Jan. 21].

Quick action on their part seems unlikely, according to European sources, particularly in the face of strong urgings by the French, Belgian and Swiss for a six-month delay.

Now it is up to OECD Secretary General van Lennep to decide when and if the guidelines should be taken up directly by the Council of Europe or undergo additional revisions at a technical level.

Some Europeans see the postponement of the high-level conference on Information, Computer and Communication Policies in the 1980s as a casualty of recent developments.

The meeting was to consider accomplishments of the Information, Computer and Communication Working Party (ICCP) over its three-year life and prepare the group's charter for the early 1980s. The unanticipated blowup of ICCP's centerpiece puts in limbo a possible OECD transborder data flow pledge to reduce threats of national barriers to the movement of commercial data [CW, Oct. 15].

Nevertheless, a new expert group is expected to begin investigating international flows of non-personal data in March.

French Objectors

France led the calls for modification in the guidelines and insistence on additional time to consider the subject. Delegations that called for changes, according to participants at the meeting, were Belgium, Canada, Denmark, Ireland and Switzerland as well as France.

A number of formal reservations were declared. The thrust of the amendments were along three lines:

- Reducing the effect of consultation and cooperation in the operation of the guidelines.
- Strengthening the rights of originating countries to enforce conditions on the transfer of personal data to other countries.
- Requiring the existence of equivalent national laws as necessary preconditions to meeting minimum guideline compliance.

These seem to be a frontal attack on American strategy for using the guidelines. Lucy Hummer, a legal advisor at the State Department and a U.S. delegate to OECD, told the Computer Law Association recently that, in comparison with the European approach, "the U.S. wants to avoid any restrictive information regime and believes the status quo should be maintained.

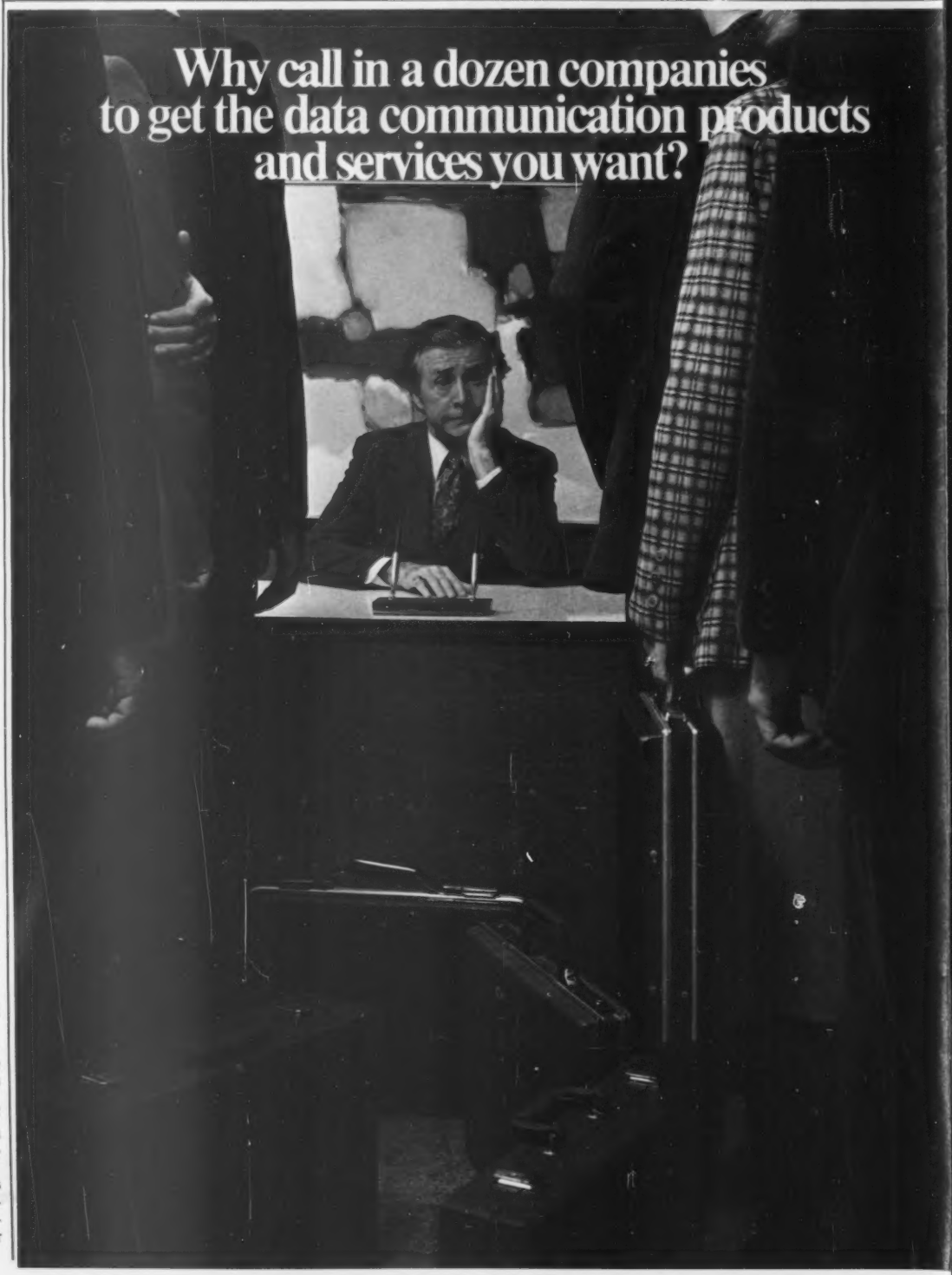
"Any changes in regulations should be slow and deliberate." She supported the OECD work "because the guidelines are not binding but they will have our government's endorsement and will be cited by our government in any controversy."

Several of the proposed changes were fundamental to the spirit and earlier requirements supported by the group. They included a request that the preamble be revised to delete the statement that countries should not "unduly hinder" movement of cross-border personal data.

Analysis

Along similar lines, the French delegation wanted to remove the pledge of "cooperation" among OECD countries when the guidlines are official. It also opposed creating any OECD mechanism to help with implementation.

Evidence of how serious some countries consider the regulation of personal data flows as a pattern for future rules over transborder activities was given at the experts'



In Limbo

Negotiations for data protection and privacy guidelines within the Organization for Economic Cooperation and Development (OECD) and an international treaty by the Council of Europe have been reported regularly by *Computerworld*. U.S. activities include an interagency task force, a State Department business advisory group and a plan by State and the National Telecommunications and Information Administration to promote acceptance of the OECD guidelines.

Final approval of an OECD document was predicted for February. Now, however, disagreements among OECD members over various provisions of the guidelines threaten to delay, perhaps indefinitely, their adoption.

Such a delay would mean U.S. firms could no longer count on the State Department to protect their interest in the continued free international flow of corporate data.

This would be especially true if, as now seems increasingly likely, the guidelines undergo major alteration or are not adopted by the time some of the more restrictive data protection laws — notably those of France and Austria — go into effect within the next few months.

CW has asked G. Russell Pipe, a consultant and writer in this field, to analyze 1979 data protection developments, giving particular attention to the OECD and the Council of Europe.

November session. Most governments believe the guidelines are motivated by human rights concerns, but some now seek to include national security, sovereignty and public safety as rationale for conditioning an open circulation of personal information.

Countries were allowed to file any additional proposals for change with the Secretariat by Dec. 20. The next move is up to political negotiators in the council or secretary general's staff.

A six-month delay would allow the French commission working on a government data flow policy, headed by Alain Matec of the Ministry of Finance, to submit its recommendations to the president.

Reports from the OECD meeting suggested that countries in addition to France, Belgium and Switzerland felt that a pause would be in their interest.

Scandinavian officials involved with data protection are expected to try to prepare a regional position early this year. Sweden, in particular, is said to be satisfied with the guidelines and wants to see them approved speedily.

Some European countries remain partial to the Council of Europe's activities and are likely to press for a text there which is close to their policies rather than pressing further with revisions to the voluntary OECD agreement.

Meanwhile, the Council of Europe's Committee on Legal Affairs (CDCJ) met in November, putting off formal consideration of its four-years-in-the-making convention until June 1980. This is to allow time for a word-by-word review of the entire text by officials carrying government policy authority.

After completion of the scrupulous review, according to one delegate, this should ensure its approval by the Committee of Ministers. But even if the CDCJ adopts the revised text and recommends Ministerial approval, countries would not be able to ratify the instrument until 1981 at the earliest.

International Laws

Delays in international action strengthen the role of national data protection commissioners. Last May the commissioners held their first annual meeting in Bonn, West Germany.

(Continued on Page 25)

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'Tourist' Explores

By Marguerite Zientara
CW Staff

AMHERST, Mass. — He considers himself an "explorer," a "tourist" in the land of what many call computer art. "I enjoy discovering new directions to follow, but I leave the in-depth exploration to others," explained Robert Mallary, originator of the diverse computer-generated designs pictured here in figures 1 through 5.

In contrast to many artists who zero in on one type of art or design in order to create a market for their own "brand-name" label of creativity, Mallary has "a broad vision" of the discipline, he said. His interests include many different types of artistic endeavor, even a practical computer-based study of the aesthetics of strip-mine reclamation (see story on page 23).

Claiming that he is not very scientific — and even that he was always "very poor in math" — the University of Massachusetts art and computer graphics professor instead attributed his success with computers to an "inventive streak" in technological areas.

"I don't have the training in engineering and mathematics to be a real electronic designer," he said, but he does have original ideas that have been translated into usable form by those who do have such training.

Figure 2

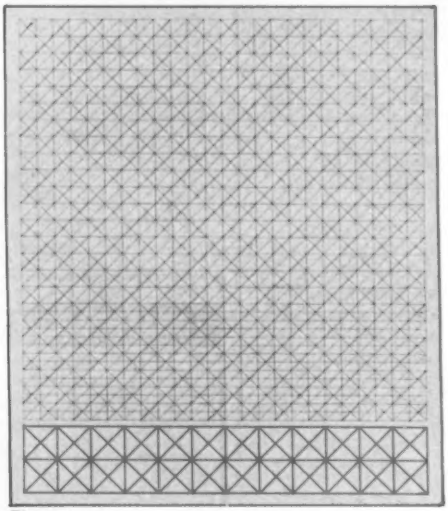

Figure 3

On this page, counterclockwise from bottom right: Figure 1 and Figure 2 are sculptures designed by the software program Tran2, which 'sliced' the shapes and indicated how they should be placed on a vertical axis to produce the final forms.

Figure 3 is a graphic design drawn with the help of a program called Graf/D and a Calcomp drum plotter.

On the opposite page, Figure 4 represents a modular floor sculpture designed by the program Shape, which allowed the artist to view the potential design from many different angles before constructing it.

Figure 5 is an example of output from the program Ecosite, written to help strip-mine operators replace, in a visually pleasing way, land removed by mining operations.

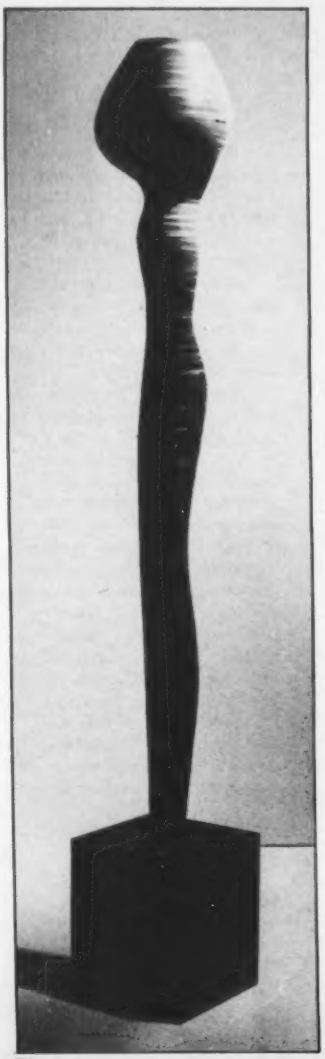

Figure 1

the Varied Landscape of Computer Art

Mallary originally developed his consuming interest in art-and-technology from examples of the Mexican mural painter David Alfaro Siqueiros, who "as early as 1932 was advocating a revolution in technology of art." However, it wasn't until 1967 that Mallary had his first opportunity to try computers in art. At that time, he began teaching at the University of Massachusetts here in Amherst.

Using student programming talent and nearby Amherst College's on-line IBM 1130 computer Mallary in three years developed a program called Tran2, from which "Quad III" (Figure 1) and "Quad IV" (Figure 2) were designed.

"Quad III," approximately 60 in. high, is a sculpture in laminated veneer. "On the basis of an input of four profiles, and using segments from four ellipses, the computer filled out each of 48 contour 'slices' and assembled them on a common vertical axis," Mallary explained.

The program also subjected the slices to a series of transformation procedures resulting in three variations of the same input, the third of which was chosen for transformation into the actual sculpture.

"Quad IV" is an 11-in. sculpture of laminated marble. Tran2 designed the sculpture and drew the cross-sections, which were transferred to the marble slabs and traced. The slabs were cut out, laminated together with epoxy and then ground to a smooth contour and polished.

Recently taken off the shelf where it's been "collecting dust" for the last decade, Tran2 may ultimately be revised to its implementation, Mallary said. Both Amherst College and the University of Massachusetts at Amherst presently lack an interactive color graphics system that would facilitate such an evolution, but Mallary feels Tran2 should eventually exploit the computer's interactive "conversational" capabilities "to speed and enhance the design of sculptural forms, continuously shaping and reshaping them by means of a large library of tranformation algorithms and routines."

Eventually learning Fortran IV, Mallary wrote Graf/D, a program that uses a plotter "for no better reason than to draw a grid of lines straighter, faster and more evenly than I could by hand," Mallary explained.

"Three-Color Computer Graphic" (Figure 3) was produced by Graf/D on the IBM 1130, using a small California Computer Products, Inc. drum plotter. Because the plotter does not have an automatic color-change feature, Mallary wrote "pauses" into the program which enabled him to change the pens by hand. Both felt-tip and ballpoint pens were used in the drawing.

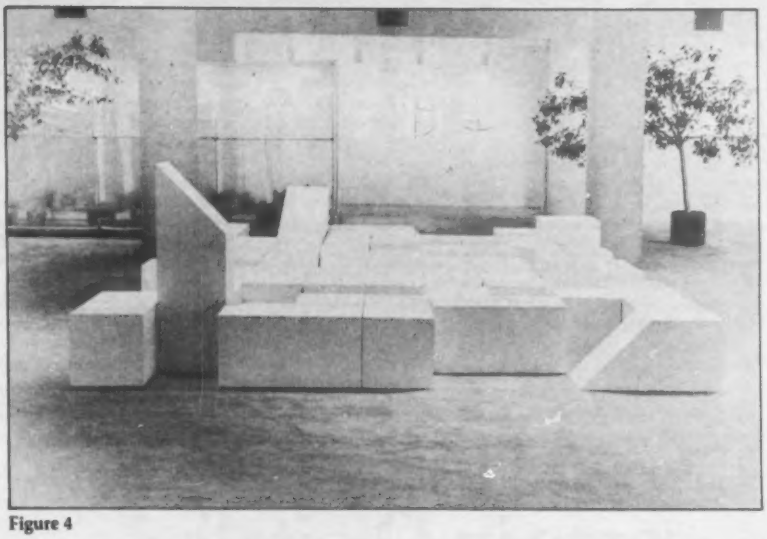

Figure 4

Related to Minimal Art and Constructivism — being very geometric, simple and abstract — the graphic line drawings take from 10 minutes to an hour to produce, depending on their complexity, with Mallary overseeing every move of the plotter and making changes as he goes.

Another program, Shape, was used to design a modular floor sculpture (Figure 4) shown last May as part of a faculty exhibition. Operating in a "quasi-random mode," the program generated 150 candidate designs, the best of which was chosen as the plan for constructing and composing the sculpture, Mallary explained.

As witness by his many sculptural works, Mallary is primarily intrested in three-dimensional art. He feels the future of computer-oriented art lies ultimately in the infant discipline of holography.

(Continued on Page 24)

A Practical Problem: Strip-Mine Reclamation

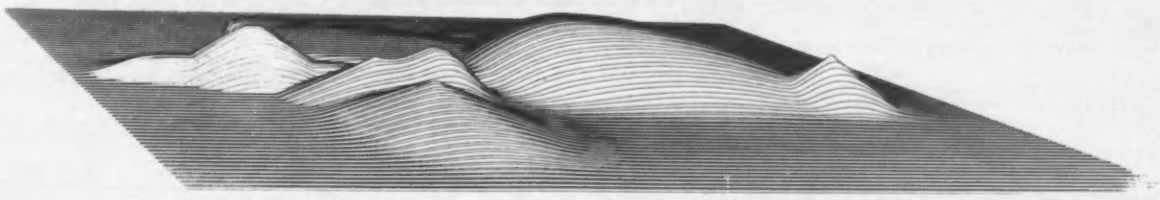

Figure 5

AMHERST, Mass. — Many people think artists are people with their heads in the clouds, but sculptor Robert Mallary is firmly planted on earth. His computer-based work focuses on the practical problem of strip-mine reclamation.

Conceived with an ulterior motive — acquiring an interactive raster color graphics system for the University of Massachusetts here — Mallary's study of the aesthetics of strip-mine reclamation began five years ago and continues today.

Initially funded in 1975 by a $15,540 grant from the National Endowment for the Arts, the project has not yet resulted in the acquisition of the sophisticated computer graphics system for the school. It has become instead "an end unto itself," Mallary said.

"I naively thought that the Washington people interested in reclamation would just drool at the thought of some people helping them improve the quality of reclamation, but we're a little ahead of our time," Mallary noted.

As part of his research, Mallary and several scientific colleagues covered 3,000 miles on a survey trip through the strip-mining regions of Kentucky, Virginia, Ohio and Pennsylvania. The project has resulted in the software program Ecosite, which produced the output of Figure 5.

Acknowledging the aesthetic, engineering and environmental restraints that surround strip mine reclamation, Mallary and his colleagues have attempted to "use

(Continued on Page 24)

'Tourist' Explores DP Art's Varied Landscape

(Continued from Page 23)

"I see the evolution of a new three-dimensional projection medium on the order of holography, but which perhaps won't be holography," he said. "There might be a breakthrough in holography, although at the present time it seems to be almost a dead-end, a very slow evolution.

"If you could imagine a projection system in which you didn't know whether you were looking at a real person or a projected image — that's what I'm talking about," he said. "You'd almost have to touch it to see whether it was real, and the only way you would know would be when your hand went right through it."

"I thought as a young man that by this time such a system would exist for three-dimensional movies," he noted, "and now I'm actually into my 60s and I'm disappointed that it hasn't happened."

In the 1940s Mallary experimented with acrylic and polyester plastics, with fluorescent dyes and pigments and with what he calls "a cinematographic approach to kinetic sculpture."

To illustrate the principle, he constructed a cluster of transparent fluorescent sculptures illuminated by black light, a work that led to his first publicity break — a full-page color reproduction in *Time* magazine in the early 1950s.

Mallary's artistic reputation is still based on his Neo-Dada and assemblage constructions done in New York City around 1960, rather than on his more recent computer-type of art.

After 1962, however, Mallary gave up using any plastics, solvents and spray cans after learning of their potentially poisonous effects. For five years before discovering the computer, he "had virtually no explicit involvement with art-and-technology."

While Mallary's first five years with computers were spent using Amherst College's IBM 1130, he now uses the University of Massachusetts at Amherst's own Control Data Corp Cyber 76 remote batch and time-sharing system.

The university also has a new four-color Calcomp plotter and a Gould, Inc. electrostatic plotter for graphics. While much of Mallary's work is currently done using cards in the batch system, he also uses a Tektronix, Inc. hard-copy CRT system.

Artist Focuses on Reclamation

(Continued from Page 23)

computer graphics for designing, simulating and testing design options for surface mine research," he said.

One design problem the computer has tackled is that of excess "overburden material" — the land-surface material that is stripped off during mining operations. "In the process of strip mining, churning up the overburden to get at the coal makes the total volume swell," Mallary explained. "It very seldom goes back the same way into the same space."

To deal with the problem, "you can set up computer programs that will take a given design and shrink it, expand it or change it some way to the point where it does take care of all the overburden," he said.

"I can now do a program where I can specify, for example, how many shapes I want to use — what class of shapes and what kind of shapes. I can specify the ratio of large ones to medium-sized ones to small ones — the space between them, the ratio of empty to full spaces. And I can specify some forms as being constant and the other forms as changing," he reported.

Ultimately, this sort of capability should allow strip-mine operators to modify and sculpt mountaintops after mining operations in order to provide attractive, usable sites without leaving behind the currently proliferating "flat tops."

Since developing the Ecosite program, Mallary's group has set up an association with Skelly & Loy of Harrisburg, Pa., a firm of mining engineers and reclamation consultants. Together, the two groups developed another proposal for a two-year, $750,000 interdisciplinary research project. That project is now "kicking around" the Bureau of Mines and the Office of Surface Mining in Washington, D.C., and the Department of Energy in Oak Ridge, Tenn.

Besides fulfilling the obvious need for an aesthetic approach to strip-mine reclamation, the proposal would place a $100,000 computer graphics system on the Amherst campus of the University of Massachusetts — and Robert Mallary's ulterior motive would be realized.

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Licensing of Personal Registers														
Central Government		x[1]		x	x		x	x[1]		x[1]	x	x		
Provinces, States		x[1]		x	x			x[1]		x[1]	x	x		
Private Sector		x[1]		x[1]				x[1]		x[1]	x	x		
Registration of Personal Registers														
Central Government	x	x[1]	x	x	x	x	x	x		x	x	x	x	x
Provinces, States	x	x[1]		x	x	x[2]		x		x	x	x	x	x[2]
Private Sector	x[3]	x[1]		x[1]	x	x[1]		x		x	x	x	x	
Responsible for Personal Register Development	x	x		x	x				x		x	x	x	
1. Purpose Specification	x	x	x	x	x	x	x	x		x	x	x	x	x
2. Collection by Fair and Lawful Means	x	x		x	x					x			x	x
3. Maintenance of Accuracy	x	x	x	x	x	x	x	x	x	x	x	x	x	x
4. Appropriate and Relevant	x	x	x	x	x	x	x	x	x	x	x	x	x	x
5. Confidentiality, Prevent Misuse	x	x	x	x	x	x	x	x	x	x	x	x	x	x
6. Sensitive Data Restricted	x			x	x			x		x	x	x		
7. Secondary Use Controlled	x		x	x			x	x		x	x	x	x	x
8. Retention Limited				x	x	x				x			x	
9. External Transfer Logged	x	x	x	x		x		x[1]				x		x
10. Security Measures Needed	x	x	x	x	x	x	x	x	x	x	x	x	x	x
11. Penalties for Violation	x	x	x	x	x	x	x	x	x	x	x	x	x	x
12. Transborder Data Flow Rules	x			x	x	x	x	x		x	x	x	x	

(Bold type for countries with data protection laws.)

1. Partial, usually according to sensitivity or specific legal provisions.
2. Subject to Provincial/State law
3. All organizations processing data other than for their own purposes.

Source: Transnational Data Reporting Service and Link

Data Protection Requirements for Recordkeepers

Disputes Delay Draft Of Data Protection Treaty

(Continued from Page 21)

The main result of this inaugural session — attended by Sweden's Freese, Austria's Stadler, France's Joinet, Canada's Hansen, Germany's Bull and Denmark's Paulsen — was to establish a plan to share information about the cases and day-to-day-problems.

Nordic commissioners, representing Denmark, Norway and Sweden, met in Stockholm late in the year. They agreed to institute exchanges of documents, experiences and personnel.

The immediate challenge for business compliance comes from Austria and France, where registration of personal records begins shortly. Detailed requirements from Luxembourg and Norway, whose laws are not in full force, have not been issued.

Future national laws are expected in as many as 10 countries, but changes of government and a pause to assess OECD and Council of Europe developments account for the lack of final action in any country during 1979.

The Constitutional Service of the Austrian Federal Chancellery has published a proposed ordinance for personal data processing to assist business and government record-keepers in fulfilling notice provisions of the Data Protection Act. The act applies to individuals and companies (legal persons), and the registration procedure calls for disclosure of extensive details that companies maintain about competitors, suppliers and other businesses.

The Austrian Bureau of Statistics will be the repository for declarations, which are open to public inspection. Registration is not universal. Organizations that can meet criteria for "strictly internal purposes" for certain record systems are exempted from registration.

The degree of detail required to satisfy Austrian expectation is "staggering," several foreign businessmen have told local authorities. Companies are required to state the purposes and characteristics of personal record systems begun before Jan. 1, 1980, unless:

- These records are completely internal, including the processing.
- Details on persons (physical and legal) are maintained according to a contractural relationship.
- All persons about whom data is collected are so notified.

New systems, third-party processing, dissemination of personal information outside internal operations and some service bureaus must be reported to the Bureau of Statistics. Most transborder data flows require permission of the Data Protection Commission.

The commission, whose managing member is Dr. Gerhard Stadler and a leader in OECD and Council of Europe deliberations, will have considerable latitude in approving cross-border transfers. For example, the commission may declare whether the level of protection afforded by other countries is compatible with Austrian requirements.

Austrian Commercial Data

The inclusion of legal persons, companies, associations and foundations within the scope of data protection laws is one of their most onerous aspects. "Legal persons are the second generation of data protection," Hans Peter Gassmann of OECD said.

Austria, Denmark, Luxembourg and Norway apply their laws to physical and legal persons. The Danes and Norwegians have indicated they are not requiring registration of company information, at least until they have experience with public and private sector registers on individuals. No details on Luxembourg's intentions have been announced.

(Continued on Page 26)

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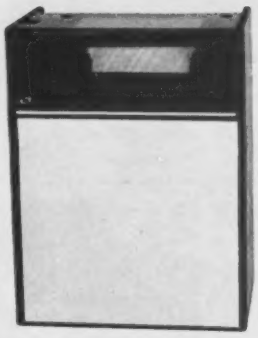

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Treaty on Data Protection and Privacy Delayed

(Continued from Page 25)

Austria, however, is requiring registration of information about other companies, customers, competitors, suppliers, prospects and so forth. Basic details about systems of records is the same as for individuals and companies.

There are separate requirements for commercial persons relative to characteristics of companies about which files are kept. These include:

- The nature of their commercial activities.
- Whether they are offices, branches or parent companies.
- The annual turnover.
- Credit position.
- Number of employees.
- Product line information.
- Fiscal balance.
- Liquidity.
- Financial integrity.
- Commercial and banking relations.
- If there are conditions on selling goods to them.
- If they are paying their bills on time.

These items are taken directly from a list of examples provided in the ordinance.

It is too early to estimate costs and inconvenience involved to comply with this law. Much depends on the interpretations accepted by the Bureau of Statistics and the Data Protection Commission. Companies required to register will need all the time allotted before filing deadlines.

Data protection laws have been looked upon skeptically by many businessmen because of suspected constraints on corporate data collection, dissemination and use. A comprehensive assessment of the wider consequences has been difficult to make until the laws, their administrators and the local environment in which they are applied could be thoroughly analyzed.

Such in-depth research was completed recently by Transnational Data Reporting Service, Inc., together with Link, Inc. Their study found that foreign data protection laws "prescribe rules affecting all data processing operations, place conditions on international business communications and are the first steps toward the broader regulation of commercial and corporate data."

This is precedent-setting legislation because it:

- Is a model for the regulation of all types of information.
- Legitimizes disclosure of company records under close government supervision.
- Opens security procedures, permits authorities to force changes, permits inspection of computer rooms and gives government access to information about operations.
- Allows employees to testify before government bodies relieved of company confidentiality rules.
- Makes data flows of multinationals and their vulnerability to scrutiny by governments of host countries, highly visible.
- Potentially compromises proprietary information for companies in pharmaceuticals, chemicals, petroleum and advertising, by exposure of testing or marketing practices.
- Forces or blocks some multinationals from some cross-border transfers of corporate data.

These findings may foreshadow OECD investigations into transborder flows of non-personal data.

American business fears that data protection will spill over into discriminatory trade barriers are being supported by the Paris-based International Chamber of Commerce (ICC). An ICC committee, headed by IBM Europe's Jacques Maisonrouge, has endorsed a research and strategy development project.

The U.S. Council of the ICC held a conference in New York recently to sensitize corporate executives to their involvement in data regulation. Efforts to generate concern in business and government circles in the UK over the economic significance of regulatory developments, however, are moving slowly.

Europe to Back DP Providers

Special to CW

BRUSSELS, Belgium — The European Community will subsidize the creation of information systems "with a value-added character such as information analysis systems, data banks and customized information services." The principal test, according to the call for proposals (C 298/4), "will be one of breaking new ground and giving European users information services not available at present."

The community is prepared to pay up to 200,000 units of account ($125,000) towards operational or developmental costs for the first 12 months of an accepted project. Proposals must:

- Contribute to community policies and objectives.
- Support capabilities providing information to all kinds of users throughout the community.
- Improve information transfer in key areas of industrial and technological development, or human safety and welfare.

The announcement does not indicate whether applications from outside the community, such as the U.S. would be unwelcome. Proposals must be submitted before Feb. 28, 1980 to the Commission of the European Communites, Director-General for Scientific and Technical Information and Information Management, DG XIII/B, Office B4/006, Batiment Jean Monnet, Plateau du Kirchberg, Luxembourg.

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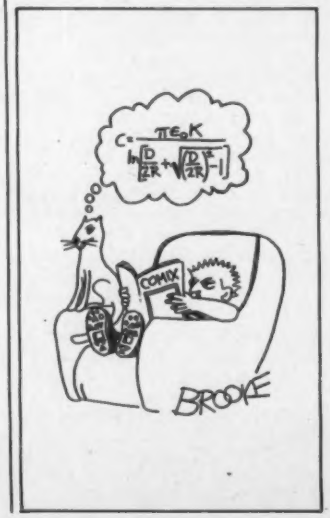

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EDITORIAL

Changes Ahead

DP personnel surveys recently discussed in *Computerworld* indicate that great changes are ahead for the nation's DP community. That is because some of the conditions found to exist at present cannot be expected to continue far into the future.

One aspect of the community that may change is the numerical predominance of males. If CW's own survey of its readers is an accurate gauge of the nation's DP community as a whole, then the present majority of males is staggering and will inevitably decline.

The survey, initiated last August, found that 92.8% of CW readers are male [CW, Jan. 21]. Given the rate at which women are now entering DP-oriented curricula in schools, a sharp drop in the ratio of males to females seems a surer bet than continued inflation.

As a result, males in DP who have difficulty in working with women on a peer basis are likely to feel mounting anxiety.

Another aspect of life in DP that cannot persist indefinitely is salary growth rates. Although demand for DP professionals should continue to remain high through the rest of the century, salary growth must taper off eventually or critical personnel will be priced out of the market.

It seems unlikely that entry-level salaries for programmers will ever exceed the salary level of top management at a given company. But, over the past several years, the latter level has lagged begind the former in terms of annual growth rates.

Younger DPers should not expect a constant rate of climb in gross pay. They should learn from the experiences of other high-demand professionals. Physicians, for example, are starting to earn more than the country seems able to pay them.

How much longer can companies afford to pay computing specialists 8%, 10%, 15% more every year?

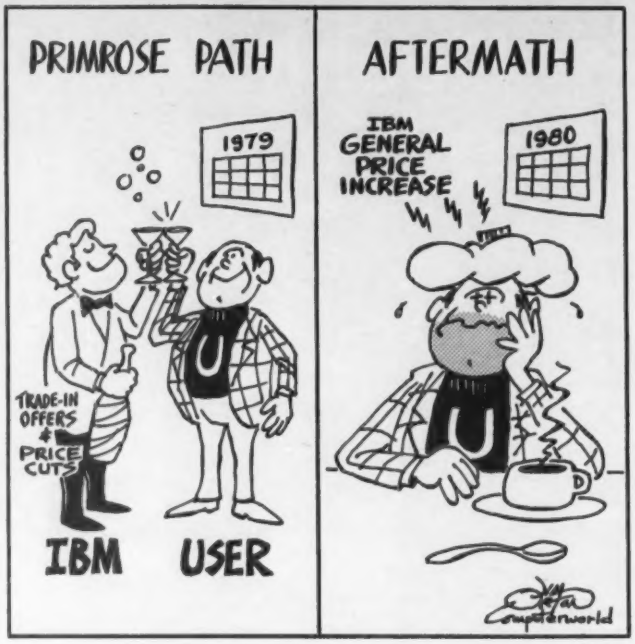
On salary, recent surveys found wide gaps in pay for given job slots among different regions of the U.S. Systems analysts evidently make far less in certain southern states than anywhere else in the nation.

The CW survey found a $17,100/year mean for systems analysts in that region compared to means of roughly $25,000 in the middle Atlantic and New England regions.

A.S. Hansen, Inc. found that the average telecommunications manager in Los Angeles makes $30,200, while his peer in Phoenix makes $17,100 [CW, Jan. 14].

DP salaries will probably be structured more equitably in the future as areas that have paid less compete with other areas for personnel in short supply.

Possible trends that will depend on technological progress include more diversity in applications as a greater variety of industries automate or automate more extensively, and less programming with more analysis in the analyst/programmer job description because of the advent of nonprocedural languages.



DATA PAST

Five Years Ago
Jan. 22, 1975

WASHINGTON, D.C. — An official of the Retail Clerks International Association reported that the installation of point-of-sale (POS) systems in supermarkets could eliminate 25% to 30% of the jobs in those stores. Clerks involved in such functions as checkout and price marking would de displaced if the POS systems came into widespread use, the union official claimed.

— — —

CINCINNATI — The capabilities — and possible strains — of a generalized data base management system came to the world of the small business system with the introduction of System/3 Total from Cincom Systems, Inc.

Eight Years Ago
Jan. 19, 1972

A recent survey revealed that the much publicized replacements for IBM's 2314 and the independents' double-density disk storage systems were very good and, in many cases, better than the IBM units.

— — —

WHITE PLAINS, N.Y. — IBM spokesmen announced that support for DOS/360 would end by April 1973. Release 26 would be the last DOS that could be used on IBM 360 equipment. And March 31, 1973 would be the last date on which users could expect to receive no-charge support for Release 26.

LETTERS

Proposal Won't Make It

Herbert Martenson's "A Proposal for Gas Rationing" [CW, Jan. 14] will never be adopted. I make this prediction, not because of the proposal itself, but because of two factors Martenson has apparently overlooked.

His idea makes a great deal of sense. It would control gasoline usage, it could be used to obtain weekly (or even) daily readings on nationwide fuel usage. His proposal would cut down on graft and would help deter the rich from having all the gas they need while the rest hitchhike to work. His proposal also would not require an immense federal bureaucracy to administer.

However, his proposal will not be adopted (it even sounds treasonous) because (1) it will not allow federal, state and local officials to receive immense amounts in bribes and graft from the rich and well-connected for special-use permits, false coupons and so forth; and (2) it does not allow for another level of bloated, worthless federal bureaucrats to impose their strange ideas and petty whims on our lives.

Chris D. Rohrs

Petaluma, Calif.

Frightening Prospect

Herbert Martenson's "A Proposal for Gas Rationing" [CW, Jan. 14] is a frightening example of the application of information processing technology. In this case, the application is the coercive recording and control of the property and actions of persons who would otherwise peaceably assert values (economic or otherwise) not approved by the goverr ment.

Since Martenson averred he has "no political ax to grind," I infer he is completely unaware of alternatives to the coercive allocation of gasoline. That particular economic good receives his attention because it is "the nation's most ubiquitous, valuable and scarce resource."

I hope that those software engineers who, like myself, value freedom as the most precious "resource" will refuse to implement such systems. When controls become ubiquitous, freedom becomes scarce.

Steven Brecher

Long Beach, Calif.

Time to Consider APL

Surprise of surprises — *Computerworld* actually printed an APL program ("Day of Week Algorithm," Jan. 14). Does this imply that CW is bestowing legitimacy on APL or merely acknowledging its existence?

I find it surprising because, amid reams of copy in CW bemoaning the ever-increasing cost of software, APL gets scant mention. The proposed solutions are basically "Band-Aid" approaches dealing with the symptoms (such as data base management system packages) and not attacking the roots of the problem.

APL has changed dramatically in the past five years, to the point where it can be considered a general-purpose (Cobol replacement) language in the proper environment. APL can be shown to be more efficient than Cobol in terms of machine usage.

In terms of programmer efficiency, there is no comparison — APL offers at least a three-to-one reduction in development time. In addition, an APL system can allow some programming to be done by the end users.

In searching for ways to reduce software costs, DP management would be wise to disregard preconceived notions of APL's deficiencies (that may have had a basis in fact a decade ago) and investigate the current state of the art in APL. They might be surprised.

Frank Cavallito

Plano, Texas

(Other letters on pages 32-35.)

THE TAYLOR REPORT/Alan Taylor

Method Adds Clarity To Program Listings

David Crocker of MIT is a compiler user, not a compiler writer, but he can teach compiler writers some aspects of their trade that are being ignored. And it is important that the compiler writers start learning what Crocker and others are saying, because the compiler writer's failure to handle the third language used in compilers is a direct cause of today's high maintenance costs and late deliveries of software projects.

The compiler writers are familiar with two groups of languages — the language input into the compiler and the machine-language output. In both of these, the structure is very formal — which is not surprising when the targets are computers, as they are in both cases. But the third language, the output description of the compiled program (normally in a program listing) is given little attention, and the fact that its targets are both varied and human, *not* another computer, gets swept under the rug.

Crocker has introduced some useful changes that are worth looking at both for their own purposes and also to see just what types of improvements are appropriate.

Human-to-Human Comments

The first Crocker change is in the handling of human-to-human comments in a PL/I compiler. The compiler carries given comments from input to output. It could do no less. Each introduction of slash asterisk into the input stream denotes a comment, to be carried along unchanged to the output listing. Crocker has included in the comment itself the author's instructions as to how much emphasis is to be given to the comment when output — that is, how it is to appear on the human-targeted program listing. Then the preparation of the program listing is intercepted so as to have these instructions implemented.

The availability of emphasis gradings is included in all human-to-human communications, although it is unimportant in computer-targeted messages. The Crocker system provides for four emphasis levels, with the standard printing of a comment on the same line as the preceding instruction being the least emphatic situation. Other comments that are placed on a separate line, set off from the rest of the material, some are still further emphasized by being boxed and, finally, some shout their message from the housetops by being placed upon a new page.

Whenever a reader sees the emphasized comments, he sees them in a set of environments that bring out the particularly important ones. The emphasis is exactly what the original programmer wanted it to be, because the decision as to what emphasis level is to be used is explicit in the number of asterisks which follows the starting slash. Slash and a single asterisk stand for an on-the-same-line comment, slash plus two asterisks for comments on their own separate lines, slash and three for the boxed comments and slash and four for comments that are given a new page.

In another area, Crocker has changed

(Continued on Page 38)

READER COMMENTARY/C. N. Winningstad

Laying the Blame In Mid-Air Near-Misses

As an instrument-rated pilot and a computer company executive, I feel qualified to make a serious comment on the flap over whether the controller or the computer failure was responsible for the near-miss incident over North Carolina [CW, Nov. 12, Dec. 17].

Pilots are trained, and retrained at intervals, to cope with instrument and system failure. If, for example, the artificial horizon goes out, we have a "backup" by using the turn-and-bank indicator and vertical airspeed to replace it incrementally, and the directional gyroscope and altimeter to do the long-term job. If there is a communications failure, we have "backup" procedures to follow, so that others know what we are expected to do, and can make allowances for our future flight path. Pilots of large aircraft are particularly well paid to be sure the best possible candidates are attracted to the job, and if they make a serious mistake, their lives are on the line.

Controllers have long been jealous of the pilots' pay scale, and through the Professional Air Traffic Controllers' Organization, their union, have done their best to achieve parity. When they (the controllers) seek to blame the near-miss on the "computer going down," they are saying, in effect, that either their "backup" equipment and/or training are deficient or they are not up to the job.

The Federal Aviation Administration probably has confidence that individual failure rates are low enough that there is not likely to be a multiple failure that makes backups unavailable, and that controllers are well trained and drilled to where they should be able to cope with the occasional inevitable failures. Doubling the meantime between failures only delays the inevitable, and having a "backup computer" only stretches the interval between failures at prohibitive cost. This means less experience with failures, so when one does occur, real panic sets in. This is why most pilots prefer to fly "uncoupled" (nonautopilot) landings a fair percentage of the time, so they are very proficient at manual flying, in case of autopilot failure.

Thus, from my point of view, controllers should not expect to be trained well enough that an occasional failure is just "another training session" — but for real. If the controllers demand a failure-free environment, then they should expect a pay cut, since they will not have to be highly trained. The 747 pilot is highly paid for his ability to handle the emergency situation; even a private pilot like myself, with 20 hours of additional training, could handle a 747 under ideal conditions; it's the emergency that weeds the men/women out from the boys/girls.

The truly strong justification for controllers' pay is that they are very busy a high percentage of the time and are required to make critical (but nonemergency) decisions at a high continuous rate. A pilot spends most of his time monitoring automatic systems. Both pilots and controllers must occasionally take emergency steps; the controller more often, but the pilot for longer periods of time (when an emer-

(Continued on Page 38)

HUMAN CONNECTION/Jack Stone

Upgraded DP Role Hinges on Qualified Leaders

There really is nothing wrong with the theory that says the management information systems (MIS) or DP function should have a "staff" or "service" orientation, but it's difficult to find many people in the business who are willing to say that it works well in practice. In this article, I present some of my initial thoughts on why the current DP organization in larger firms should be revised to accommodate an upgrade of the department to that of a major line activity — reporting to the highest level — with a substantial expansion of operating functions and increase of responsibilities.

One of the most important reasons for considering a new approach is that the current structure, in which DPers are supposed to serve the users with the same elan as a vendor serving his customers, has resulted in intolerable backlogs of systems development projects. During recent years, users have grudgingly come around to admitting that DP *does* make things a little easier for planning and operating personnel, at least enough for them to bombard the DP group with systems development requests in such numbers and complexity that the extensive backlog has labeled DPers as being nonresponsive. The interdepartmental committee process that decides which of these requests to honor has become time-consuming and resource-wasteful at best, if not a laughing stock of the DPers, in part because almost every new idea — sane or crazy, short of automating the kitchen sink — is tossed into the backlog queue and must be evaluated in accordance with systems feasibility study standards.

This is the third article in a four-part series, "DP Management in the '80s."

The situation is not too different from that of a new manufacturing business, where the sales section levies an unending stream of product demands on the engineers — with the tacit agreement of the president — and produces conditions that drive the engineering development backlog out of sight.

Useful Model for DP

What's happened to the engineering function over the years is a useful model for DP. Engineering has grown into a "line" activity with major responsibilities within a company and headed by a senior executive, usually endowed with proper authority and clout through a vice-presidential (or better) title. This reporting relationship, among other advantages, has helped establish the engineering activity as a critical part of a business, given the "users" a proper direction through a long-range plan and developed a mutual respect in interdepartmental dealings.

Today, most DP departments operate as mere appendages to the financial or administrative (or other staff) function and, therefore, are represented at the senior executive councils by well-intentioned financial or administrative managers whose understanding of information systems rarely penetrates the mysteries of the punched card. As a result, not only backlog ruminations but strategic decisions relating to every facet of the DP business — machines, personnel, systems development, operations, facilities, services, interdepartmental procedures — have, too often, been uninformed and, on occasion, been made against the best interests of the DP group and the total organization. Improved strategic planning is only one of many reasons for elevating the MIS function; others will be discussed later in this series.

A number of distinguishing characteristics of a DP function make it a candidate for an upgrade, and I mention some of them here, not in any particular priority: first, DPers currently support applications that are critical to a number of operational areas involved in the main thrust of the business; second, the DP function represents a substantial assignment of financial, personnel and management resources; and third, the firm is committed to long-term plan for the development and expansion of information systems activities.

Of course, the DP function of nearly all of the larger firms and government agencies meets these criteria. But before you grab a pair of scisors to cut out this article and present it to your boss to justify your promotion, you should be aware that top-ranking company officials are generally aware of the need to upgrade the DP department but have not been rushing around in "DP reorg mode" because they are not satisfied that current DP management can effectively emulate the functions of a senior executive.

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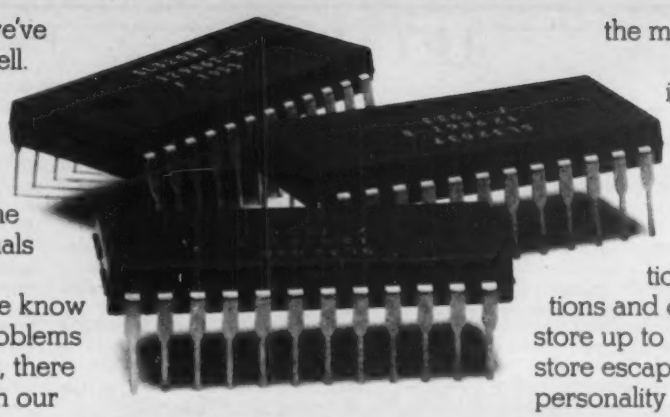

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LETTERS

Better Plan for Rationing

Computerized gas rationing, the subject of a recent Reader Commentary [Jan. 14] is an interesting idea. However, there is an even more efficient, practical and simpler means of fuel allocation.

The system I speak of takes advantage of "ration cards" already in circulation and freely traded. Furthermore, it has stood the test of time as it has been in use for thousands of years. I refer, of course, to money.

The advantage of using money as a medium to allocate scarce resources is that it allows each consumer to independently determine his own needs, rather than have those needs determined by the government bureaucracy. Distributed processing vs. central site processing, if you will.

I would suggest, then, that rather than formulating grandiose schemes to further centralize the economy, we press for a removal of price controls and allow the free market to do its work.

Eric Balkan

Bethesda, Md.

Heated Debate

The "Reader Commentary" by Stanford L. Vogel, "Halon May Not Be Best Protection" [CW, Dec. 17] deserves comment.

I'm not sure Vogel was successful in his aspiration to avoid "fanning the flames of the Halon/water debate." Instead, he may have fanned the flames to a higher heat and moved the controversy onto the front burner.

Rather than participate in this controversy, I feel every individual DP manager should assess the pros and cons of Halon vs. water for his own facilities. In data processing areas, if speed of detection, location, suppression and recovery of operations are paramount, Halon has much to offer. If downtime (caused by cleanup and dryout after fire) is unimportant and some possible damage from heat, smoke or water is not critical, water may be the best answer — as it is cheaper.

There are any number of variables in each operation, and it would be very difficult to promulgate a general rule for either water or Halon. For example, the higher initial costs of Halon systems must be compared to the risks involved in the particular operation in question. What will justify Halon installation in one place will not apply to the next.

There should be no Halon/water controversy. Both systems have their merits and demerits. The dollars are relatively easy to compute. National Fire Protection Agency (NFPA) standards describe the engineering required, and there is sufficient experience with both. The NFPA Halon standard was adopted in 1970, and there are over 10,000 Halon installations worldwide.

Unfortunately, because there is a controversy, one must be careful when studying the problem and be alert for bias. For example, the National Aeronautics and Space Administration standard, to which Vogel referred, considers none of the positive aspects of Halon but religiously lists most of the advantages of water systems. Such a standard cannot be considered unbiased or objective.

Let's end the controversy. There is no perfect single fire protection system. If each manager or consultant will carefully analyze the needs of the user, the critical applications and the risks involved and calculate what kind of system is needed, we might begin to end this ludicrous discussion.

When a paper or standard shows some bias, let's consider all the facts — including the opposing view. Then let's base our decisions on hard facts and cold numbers. I don't think there is any other way.

Ed Coggins

Fort Worth, Texas

Get Wise

Dave Witthans' letter "Become With It?" [CW, Dec.10] concerning Terence Hughes' letter "The King's English" [CW, Nov. 19] was in error.

Witthans criticized the phrase "get wise" and said the correct phrase is "become wise." My *Webster's New International Dictionary* (second edition) lists "to become" as one of the meanings of the intransitive verb "get"; it lists "to get free" as an example and does not qualify this definition as substandard, slang or vulgar.

Get wise, Dave.

Jim Scott

Richmond, Va.

Someone Spoke Up

It is commendable that the Data Processing Management Association (DPMA) has, after 10 years, conceded that "Man of the Year" may be an outmoded title for its award. It is not true, however, that (according to an association spokesman) "DPMA has received no criticism over the title."

In 1972, I wrote a letter to the DPMA board, pointing out the incongruity of such a title, particularly since the first award was presented to a woman. I asked that DPMA consider changing the title. The response I received from the president was a masterpiece of ridicule and condescension. The DPMA Executive Board had unanimously found the request to be trivial and not worthy of serious consideration.

I can't believe I am the only person who ever criticized the title. Perhaps the association spokesman is uninformed.

Judith B. Edwards

Portland, Ore.

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LETTERS

Data-Driven Design

Kudos to Hugh W. Ryan on the In Depth article "Structured Methods" [CW, Dec. 3]. My own experience in structured methodologies closely parallels Ryan's. I am convinced that "data-driven design," as described by Ryan, is a vast improvement in methods for designing informational-type computer applications.

I would like to add that the logical data model is extremely important. The data is the foundation of the system. If the logical data model is defective, the end product will be accordingly defective.

A good logical data model does not guarantee a good system, but a lousy model will guarantee a lousy system.

Unfortunately, most of today's data models are kludges. They are Rube Goldberg affairs, the result of whimsey and chance rather than reason and expertise. In fact, only a relative handful of DPers know what a logical data model is, and DPers who can design state-of-the-art logical data models are rare enough to be on the endangered species list.

I believe logical data model design is an emerging specialty within data processing. I'm convinced that the growth of this new specialty is inevitable, and I prefer to see this growth occur in an orderly and professional manner. I would like to correspond with others who are interested in logical data models and data-driven design.

Jo Paul Bigley

Sacramento, Calif.

Facts on Chess Tourney

"Levy Undefeated in Computer Chess Tourney" [CW, Nov. 19] reported on the Northwestern University Computer Chess Program (Chess 4.9), of which I am a coauthor. The program receives considerable media attention, and the accuracy of the reporting varies widely from item to item. Once in a while, I am inspired, in the interest of quality control, to offer correction and/or clarification of a given article.

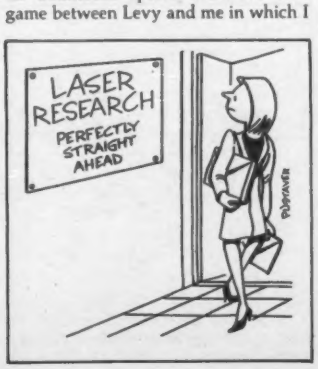
In this case, it seemed that your reporter did not have a clear idea of what our annual tournament is about. He said in the first sentence: "International Chess Master David Levy won again in the Association for Computing Machinery's (ACM) annual computer chess tournament, which regularly pits Levy against several of the world's most powerful automated chess programs."

The main purpose of this annual (since 1970) event is to pit computers against each other. Levy's role is to direct (oversee) the tournament, but not to participate in it. ACM '79 featured an additional special side event: a game between Levy and me in which I was aided by our computer program (Chess 4.9). This was the first such match and is not a regular feature of the ACM tournament.

In two other years, special exhibitions were arranged in which Levy played against all of the computers simultaneously, but these were also peripheral to the computer tournament itself.

David J. Slate

Evanston, Ill.



Point of Clarification

The article "Lawyer Involvement in System Design Defended" [CW, Nov. 26] reported on a talk by J.T. Westermeier Jr. at a meeting of the Data Processing Management Association (DPMA) in Washington. Subsequently, a letter from Kenneth P. Carroll [CW, Dec. 10] referred to Westermeier as "an official of the American Bar Association." I think a clarification is in order.

Westermeier is chairman of the Subcommittee on Professionalism and Malpractice of Computer Specialists. This is a subcommittee of the Committee on Law Relating to Computers of the Section of Science and Technology, one of the subdivisions of the American Bar Association.

The association has made no policy determination with respect to any of the topics on which Westermeier was reported to have spoken. The bylaws of the association specifically provide in that situation that "any member who, when making a public utterance, permits himself to be identified as having an official connection with the association or one of its sections or committees, shall ...identify his utterances as his personal views."

I realize Westermeier was discussing contractual problems in the computer field and that his connection with the American Bar Association was mentioned only for identification purposes. I would like CW readers to understand, however, that Westermeier's remarks were purely his own views and in no way express the viewpoint of the American Bar Association.

Robert Bigelow
Chairman
Committee on Law
Relating to Computers
American Bar Association
Woburn, Mass.

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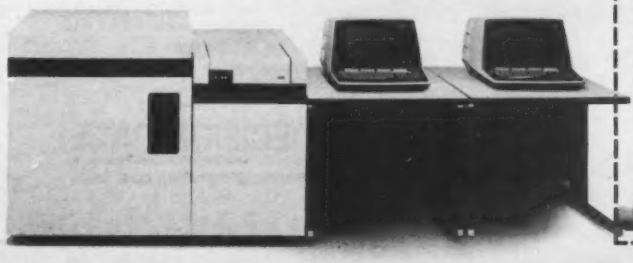

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LETTERS

'Practice What You Teach'

Concerning the article "Plato in Eye of Florida Education Controversy" [CW, Dec. 10], I can sympathize with Dr. Alfred Bork's frustration in trying to identify microcomputers as a legitimate alternative to mainframes in education.

Those very same people charged with developing creativity in our children are falling far short of practicing what they teach. For an educator to be satisfied with an outmoded system "until something better comes along" is wrong. Rather, a loud demand for "something better" should be issued.

Micros are economical. Micros are here. Educators shouldn't be the last to recognize it.

Rodney S. Marshall
Systems/Programming Manager
University of Akron
Akron, Ohio

'Iliterate' Programmers

On behalf of the board of directors of our new society, the International Personhood of Iliterate [sic] Programmers (Ipip), I would like to thank Jeff Beeler and *Computerworld* for the announcement and introduction to the DP industry, [CW, Nov. 5].

The requests for applications have been overwhelming. Programmers, analysts and managers are volunteering their entire staffs for membership. Obviously the appeal of our society is not limited to programmers nor should it be. We welcome data processing executives, managers, analysts and operations personnel. We all know iliteracy is not limited to programmers alone. In fact, programmers are more often the victims rather than the cause of iliteracy.

Ipip plans to have two yearly awards. The Literate of the Year and the Iliterate of the Year. For Literate of the Year we will seek nominations in the categories of executive management, analyst, programmer and operations for those persons who have made outstanding contributions in efficiency, morale or productivity.

Upon selection of the winners in each category by Ipip's board of directors and publication of the names in the *Journal of Iliterate Programmers* (JIP), the winners can claim their certificates upon payment of a $25 fine. (What other society punishes their members for literacy?)

The Iliterate of the Year award goes to an iliterate process rather than an individual. For example, a headline in the *San Francisco Chronicle* for Nov. 17 read, "Five Million Dollars in Treasury Overpayments," the cause of which was "a computer error."

"However, Ipip does not seek headline clippings alone. All examples of iliteracy must be fully documented. Complete anonymity of the submitter and company is assured. The goal of Ipip is to educate, not to embarrass members.

The organization or the people involved will never be remotely alluded to. However, if a group wishes to come forward and claim the award, Ipip will award them a $50 certificate towards an educational seminar of their choice to raise their level of literacy.

Application forms are being prepared and will be ready for mailing shortly. Please allow four to six weeks for the first reply. Don't forget to include a self-addressed stamped envelope for all correspondence. The address is 776 El Cerro Blvd., Danville, Calif.

Gopal K. Kapur
President

Ipip
Danville, Calif.

An Ipip Candidate

Gopal Kapur and his International Personhood of Iliterate (sic) Programmers [CW. Nov. 5] may be interested in a short case history on the use of structured programming and associated techniques.

My former programming manager implemented structured testing and cut our work by 20%. The use of PL/I rather than Assembler language decreased our effort by 35%. Structured design and coding increased individual programmer productivity by more than 300%.

Structured analysis improved our user relations and simplified system turnover so much that we began to have idle time during the day. We invested that time in structured walk throughs on all existing systems, so that we and the programming manager would understand our applications better.

Finally, we implemented the "Chief Programmer Team" concept, with our manager as the chief. It worked so well, that he laid off all the programmers (including me) because he could do the programming himself.

At last report, he is serving as the computer operator and doing all the programming on his lunch hour! Please enroll me in the Society of Iliterit (and unemployed) Programmers.

Rich Zahniser
Colorado Springs, Colo.

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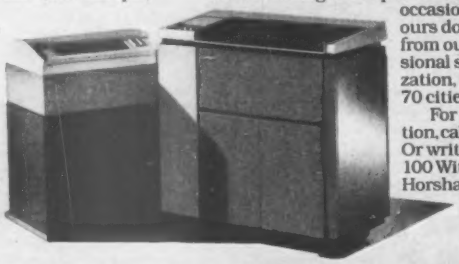

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LETTERS

No More Arguments

For the past several months, we have witnessed two programmers "raking each other's bows with fire" in the name of structured programming.

This letter is not addressed at either of them, but at the poor dolts who are paying their salary. What was delayed or suffered from this academia? The new paryoll tax system? Billing? Accounts receivable? Are you happy with their results?

As long as "structured programming" remains unenforced, it becomes subject to the whims and vagaries of interpretation and standard. What you need is a language that absolutely enforces structured code, that will operate as nothing else, and will end this bloody debate.

We at the Civil Aeronautics Board have had such a language for the past six months. It came with Software AG's Adabas, our data base management system (DBMS). This natural language contains a text editor and automatic reconciliation with the data dictionary such that it is absolutely impossible to code nonstructurally — without a lot of work. It is similarly difficult to get an abend of any kind. Compilation on-the-fly gives total development in hours instead of weeks.

Excuse me. We love it. And, there are no more programming arguments. So, check out your DBMS and see if you can't dynamite your closet scholar into contributing more to the corporate coffers by making the entire discussion arbitrary — you'll be doing him a favor.

Dan Nolan
Washington, D.C.

The Real Point

I have been mightily amused by recent discussions in *Computerworld* concerning Cobol. What began as a Cobol apology to the modernists has turned into a holy war between rival Cobol sects.

This, of course, has delighted those who never did like Cobol and who managed long ago to convert to some newer, more rationalized language. Who would have thought that so many articulate programmers would fight code with code? Or that none of them would ever question the divine inspiration of their scared text, the Cobol language standard?

Of course, a few of the arguments presented actually do make sense even to the uninitiated. One such is that structured coding is not the same as the complete elimination of jumps. It is unfair to equate Dijkstra, who has made a great contribution to the science of software, with a common GOTO-less zealot. The call for complete eradication of jumps is itself a heretical misinterpretation of Dijkstra's work.

Another argument from within the ranks of Cobol which makes sense, once its subtlety is grasped, is that while structured design is a method of doing something, structured code is a classification of an existing product. The best methodology, by definition, in general produces the best end result. But the end product does not provide much description of the methodology. A good guess is that the methodology used by the Cobol combatants is more closely related to creation of fiendish counter-examples by divination than to application of structured design techniques to real problems.

The modernists are off in another world, discussing clearer, faster, more concise, tighter, more flexible — in short, better — code. The Cobol proponents meanwhile argue forcefully with each other their point that it still compiles. The point at issue ought to be whether it is a lot more possible to write reasonably structured programs in some other language.

An appropriate interface between programmer and machine should be precise and concise as well as powerful. The propsed new Ansi standard for the Cobol language is an implicit admission by at least some of the Cobol followers that the language lacks precision. It will be interesting to see which of the Cobol factions embrace the new standard, which is scarcely recognizable as the Cobol they all now defend so staunchly.

Perhaps the dissidents should consider what to do about the financial investment in existing Cobol programs.

Chuck Kollars
Sunnyvale, Calif.

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J. W. Marriott, Jr., President, Marriott Corporation, Washington, D.C.

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Clear Program Listings Bring Repeat Benefits

(Continued from Page 29)
the way loop depth is shown on the program listing from its current single-digit form to being a listing of each loop that is currently in progress at any code statement. A two-depth loop is shown as "12," rather than just "2," a three-depth code as "123," not just "3," and so forth.

The result of these changes has been quite dramatic for Crocker, particularly in teaching programming. The students, who are advised as to what general level of comments of each emphasis are expected, now seem to be able to keep the picture of what is going on much more clearly defined. Most of the difficulties that previously were rampant, but which came from lack of focus rather than any difficulty in understanding, have been drastically cut back. (There are no details regarding maintenance effects of the Crocker changes because of the nature of the MIT environment).

Impact, Not Information

It is important to note that the Crocker changes do not add any information. They *do* make information more understandable to humans. Compiler writers who want to be as expert with human language output will have to take into account the whole range of human characteristics when writing for human targets. If not, the Crockers of this world will be forced to come in and take over this part of the operation.

The impact of a more effective system of communication through program listings and supporting material is not just one-time, but repeated. It will be repeated each time a listing has to be referred to by anyone for any reason, because the listing is the only document that gathers the work of both program authors (the compiler writer really is an author too, you know). And reference to program listings is needed when the system is being written, tested and maintained. These are separate occasions, and the impact of good program listings must be looked at in each case.

Maintenance Effectiveness

Reduced effectiveness of communication between the authors and those responsible for maintenance while the program is in actual productive use is probably the most serious result of inadequate design work with the program listing. Maintenance is the major cost factor in running computer systems at this time.

Failures here, or delays here, add to the already out-of-proportion cost of maintenance. Clearly, anything that Crocker or others can do here is most helpful.

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Laying Blame For Incidents

(Continued from Page 29)
gency does occur).

To summarize, if the controllers wish to retain their high pay, they should not try to claim their errors in procedure (for example, in handing off aircraft from one sector to another) were caused by a computer being down. True, the computer being down complicates a handoff, but just as the pilot is trained to "fly the plane first, then communicate," the controllers should do the important things first.

The saving item is the "RAF effect"; that is, there is a high volume of air, and the probability of collision is fortunately low, even without air traffic control (during World War II, the Royal Air Force (RAF) used no enroute control, since the loss of aircraft resulting from collision was far, far below the potential loss because of communications interception by the enemy). Since the gravest danger is when a "new" situation can come up (under steady-state conditions, the aircraft have been placed so as not to collide), aircraft changing altitude and/or sectors should have the first call on controllers' attention, during a "routine" computer-down situation.

Winningstad is president of Floating Point Systems, Inc. in Portland, Ore.

Two Views on Choosing Software

•Focus on Vendor Support

By Earle Downes
Special to CW

When evaluating and selecting software, one of the most used criteria concerns vendor support.

Although questions relating to support are invariably asked during interviews with established users of a product, too frequently they are nothing more than cursory or obligatory queries. The responses are tabulated, compared (occasionally) to some previously published report to ensure that the vendor is maintaining a reasonable level of support and then forgotten.

If your organization enjoys the luxury of being able to install a product and operate that same product without modification throughout its useful life, then this approach will usually suffice. If, however, specific modifications are required for your installation or if you do not have a technical support person to install package upgrades and handle questions regarding day-to-day use, then you would be well-advised to delve deeper into the issue of vendor support.

One of the foremost considerations should be a vendor's ability to respond to varying levels of technical questioning from the user community. Whether its support staff is centrally or regionally located, the vendor should be able to field questions from the most basic to the very complex regarding the package and its related options.

Most vendor organizations

(Continued on Page 46)

•Focus on Corporate Aims

By Craig Johannsen
Special to CW

Software evaluation is so complex a task that it is at present more an art than a science. The number of factors to be considered is so large and their interaction and implications so complex that thorough evaluations of any but the simplest products are exceedingly costly and, as result, are seldom if ever done.

So, for management to get the best possible evaluation for the lowest possible cost, compromises must be made. Attention will have focus on the most important aspects of the evaluation process at the expense of the less important ones.

A key question, then, is: Which aspects are most important? The answer hinges on two basic points:

• The software package must contribute in a nontrivial way to helping the user firm achieve its basic objectives, which generally include a certain type and level of service, profit and long-term survival.

• The software package should be able to adapt to change — most notably, growth of a company's volume of business — and continue to function in a useful way for as long as possible.

This is the first half of a two-part article on how to evaluate software. Next week: objectives every software package should satisfy.

The data processing department must gain a clear understanding of the firm's objectives and possible barriers to achieving them. The amount of money available, the market served, the nature of the firm's competition and of its employees, corporate policies and requirements imposed by government legislation or social pressure are environmental constraints that almost always impact a firm's ability to meet its objectives.

Once these constraints are known and the firm's goals and problems requiring a software solution are understood, the DP manager or a designated management team including prospective users should draw up its own set of objectives for the software package to meet. Further, these objectives should be ranked in

(Continued on Page 44)

'Cops' Boosts Level 66 Productivity

BERKELEY, Calif. — Users of Honeywell, Inc.'s Series 60 Level 66 can reportedly boost their processor's productivity by at least 10% with a load scheduler/-simulator package from Intermethods Corp.

Known as the Computer Operations Planning and Scheduling (Cops) package, the product simulates the impact of configuration or work load changes on system throughput. For example, the package can indicate whether a user's existing configuration can support an additional on-line application or whether an upgrade to another processor will produce a desired increase in DP productivity, according to an Intermethods spokesman.

Cops also simulates the impact of various schedule changes on system efficiency and then selects the job sequence that requires the least amount of computing time. From this information, the package produces a daily processing agenda that ensures the optimum use of available system resources, the spokesman said.

In planning a site's daily processing schedule, the software package begins with a data base that consists of a job profile and a description of the user's current configuration. The job profile specifies the computing resources required to do a particular application.

To the original data base, users then add information describing the order in which they would like their applications to run. Within a few hours or even minutes, Cops produces a finished schedule listing the amount of time each job takes and the time each one begins, Intermethods explained.

If the first schedule proves unsatisfactory for any reason, users can produce a second one simply by changing the order in which they want their computing jobs executed. Cops reportedly allows users to simulate as many computer runs as necessary until they find a job sequence that meets their scheduling needs.

Although designed primarily to operate with large-scale Honeywell equipment, the package is written in Cobol-74 and thus is transferable to other systems models, Intermethods said.

The software was written and is owned by Theseus Konsult AB of Sweden and is said to be unavailable from any U.S. mainframe vendor.

Cops, whose price starts at $8,000, can be obtained from Intermethods, Theseus Konsult's U.S. and Canadian distributor, at 181 Vicente Road, Berkeley, Calif. 94705.

'FMS-11' Extended to RSX-11 Users

MAYNARD, Mass. — Users of Digital Equipment Corp.'s PDP-11 minicomputers and PDT-11 intelligent terminals running under the RSX-11 operating system can now use the FMS-11 forms management package.

Previously, FMS-11 was restricted to medium-sized PDP-11s using the RT-11 operating system.

The FMS-11 package allows users to develop forms on their CRT screens. It consists of a series of utility programs that use key features of DEC's VT100 CRT terminal.

The package supports applications written in Fortran IV, Fortran IV-Plus, Basic-Plus-2, Cobol and Macro-11. The applications programs can call FMS-11 for data input to a whole form or an individual field.

Ascii strings are passed between the terminal and the host computer to designate the form or field. The application is bound to the terminal driver without compilation or linking, DEC said. FMS-11 for RSX-11 users costs $2,700 and will be available in February, according to DEC.

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PEP Builds Packages For System/3 Model 15D

FULLERTON, Calif. — Two software packages for IBM System/3 users have been announced by Productivity Equals Profits (PEP). The first provides support for interactive programming; the second is a library of subroutines for use with RPG-II programs.

The On-Line Programming package has three modules designed for installations with System/3 Model 15Ds using IBM's Communications Control Program (CCP). It is, according to PEP, "very similar to the IBM Field-Developed [Program called] On-Line Jobs."

On-Line Programming has all of the features of On-Line Jobs, the spokesman said without defining what those features are. He added that the PEP package provides easy access to the system's console screen image, the simulation areas and libraries available.

Distributed on 96- or 80-column cards, magnetic tape or diskette, On-Line Programming costs $600.

The library of 46 general-purpose assembler subroutines was also developed for the Model 15D RPG-II programmer. The entire library can be acquired for $5,000, but individual routines can be licensed for $150.

PEP is at Suite 224, 1370 Brea Blvd., Fullerton, Calif. 92635.

Complete Control System Installed on Factory's Mini

By Ronald S. Pavluvcik
Special to CW

CHESHIRE, Conn. — A complete manufacturing planning and control system, including a material requirements planning (MRP) module, has been successfully installed on a minicomputer here at Siemens Corp.'s Medical Systems Manufacturing operation.

The package, called MAC-PAC, is available from Arthur Andersen & Co. of Chicago. It had been previously available for IBM System/3 computers and was converted by Arthur Andersen & Co. personnel for the Data General Co. Eclipse C/330 at the Siemens location.

All programs except utilities are written in RPG-II. Subtle differences between IBM and DG operating systems and RPG-II compilers were identified during the package conversion, but presented no serious problems.

The actual package implementation started in September 1977, immediately following the delivery of the purchased Eclipse. The modules of MAC-PAC installed (and running successfully) since then include design engineering, manufacturing engineering, inventory control, product costing, MRP, capacity planning, shop floor control, labor performance reporting and inventory accounting.

It probably should be noted that prior to getting the Eclipse hardware and the Andersen software, the operation had no DP capability at all. Perhaps starting from a manual system is easier than converting from one automated system to another.

Most of the systems and programming work during the package installation was performed by Siemens personnel, with Arthur Andersen & Co. supplying the project management consulting assistance which kept the project on schedule and under budget. The installation was completed on Sept. 30, 1979.

The MRP module has been credited with lowering the stockroom inventory at Siemens by 20% after just one year of operation (while reducing parts shortages) by planning the timely arrival of needed material from outside vendors and factory workcenters.

The MRP logic uses a master production schedule exploded through bills of material to find out what parts not on hand or on order are needed to make finished products. In the case of Siemens' Chesire operation, the finished products are various diagnostic X-ray equipment.

Siemens believes its success with the system lies in two areas:

- The package was installed with a minimum of program changes.
- Monthly project meetings attended by top management were held to resolve problems and expedite decisions. Such top management involvement, commitment and support motivated the project team and kept the installation on schedule.

Pavluvcik is manager of information systems at Siemens' Medical Systems Manufacturing operation in Cheshire, Conn.

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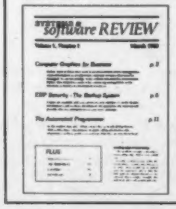

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'CIS Cobol' for Micros Gets Government OK

SANTA CLARA, Calif. — A version of CIS Cobol for microcomputers offered by Micro Focus, Inc. was recently given government certification, company officials announced.

This means microcomputer users of CIS Cobol are now eligible to bid on government contracts for data processing operations, Micro Focus Chairman Bryan Reynolds explained. Users who are not interested in government contracts can now use many software packages developed for larger systems, such as the IBM System/34, on microcomputers, according to Reynolds.

The Micro Focus version of CIS Cobol is the first such package designed specifically for microcomputers to be given government certification. Seventeen other companies' versions of the language, all designed for larger systems, have gained government certification, Reynolds said.

The certification was given by the General Services Administration (GSA). About 100,000 lines of Cobol test source code had to be successfully processed.

The test was developed and administered for GSA by the Federal Compiler Testing Center, Reynolds noted.

The Micro Focus version of CIS Cobol was tested at the firm's home base in London in November and was certified in December.

Marketed by the company's branch here, CIS Cobol is a portable system for compiling, debugging and executing Cobol programs on Intel 8080, 8085, Zilog Z80 or Digital Equipment Corp. LSI-11 microcomputers.

The interactive CIS Cobol package allows the user to debug programs in increments on a CRT terminal. In real-time applications, a runtime option module displays a full screen of data on a CRT terminal with a single Cobol language command, according to the vendor.

Conforms to Ansi 74

Micro Focus' CIS Cobol conforms to the American National Standards Institute (Ansi) 74 standards. This assures that Cobol programs will compile regardless of the size of the original development system, the vendor said.

The GSA certification is a "federal-low-intermediate" classification, meaning it combines the elements of Ansi's Level 1 and Level 2 standards. Other compilers certified at that level include IBM's Series/1 and System/34, DEC's PDP-11 and Honeywell, Inc.'s Level 6 processors, all of which are minicomputers, Reynolds noted.

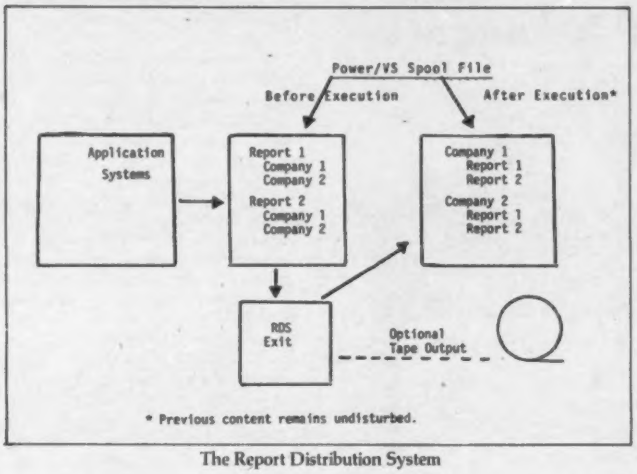
The CIS Cobol package is supplied to users with a compiler, runtime system and interface module. Forms, used in screen formatting, and Forms 2, which aids in program generation, are optional features.

The compiler and runtime system are usually written in the microcomputer's assembler language.

Interface modules are specific to various operating systems. These include CP/M for the Z80, RT-11 for the LSI-11 and Isis-II for Intel Corp's Intellec. The interface module is the only CIS Cobol feature that is not interchangeable.

The CIS Cobol package costs $850 for CP/M and $1,200 for RT-11. Forms 2 costs $200 for the CP/M version and $300 for the RT-11 version, the vendor said from 1601 Civic Center Drive, Santa Clara, Calif. 95051.

Package for 370s Eases Distribution of Reports



The Report Distribution System

BIRMINGHAM, Ala. — IBM 370 users running DOS/VS, DOS/VSE, Power/VS or Power /VSE can get the Report Distribution System (RDS) from Financial Industry Consultants, Inc.

RDS solves many of the distribution problems involved in processing data on more than one organization, the vendor said.

The package permits report data to be printed in a report-within-organization sequence. Data is normally printed in an organization-within-report format, a spokesman noted.

RDS allows the user to alter the print sequence of report data to print first the last company data usually printed last in a sequence. This can result in an 80% to 90% work load reduction, the spokesman added.

The package reads the 370 Power/VS spool file without changing the original report data. A restructured report can be returned to the Power/VS spool file or placed on tape.

It can also be optionally transferred to a user exit to satisfy microfiche requirements, Financial Industry Consultants said.

RDS costs $200/mo, the vendor said from Suite 218, 244 Goodwin Crest Drive, Brimingham, Ala. 35209.

System/34 Gains File Support Aid

W. MONROE, La. — A file maintenance program generator for the IBM System/34 is available from Bancroft Computer Systems, Inc.

Called FMGN34, the package will generate System/34 workstation-oriented RPG-II programs. It will also screen formats and procedures to maintain user disk master files, the vendor said.

FMGN34 costs $800, which includes documentation and source code. The vendor is at P.O. Box 1533, W. Monroe, La. 71292.

Application Design Course Scheduled in San Francisco

SAN FRANCISCO — A course to help applications project management and technical personnel design improved performance into new applications will be offered here Feb. 25-29 by the Institute for Software Engineering.

"Designing Performance Into New Applications" will cover the technical and project management techniques needed to specify and control the performance characteristics of new applications during their development and production phases. Instrumentation and reporting technique requirements will be addressed.

The course is designed for applications and project managers and technical personnel who have no prior experience in software physics or related measurement techniques, institute officials said.

The first presentation will be held at the Kyoto Inn and costs $435 for members of the institute and $650 for nonmembers. Additional courses are planned at other locations throughout the year. More information is available from Dave Morley or Dave Schumacher, Institute for Software Engineering, Member Services Department, P.O. Box 637, Palo Alto, Calif. 94302.

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Operating Environment: IBM System 360/370. CICS/DOS/VS, CICS/OS/VS-COBOL, PL/1, ASSEMBLER

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MOUNTAIN VIEW, Calif. – When a large corporation has a 2,000-page phone bill each month, keeping close track of calling information becomes a priority item.

At Fairchild Camera & Instrument Corp. here, phone calls are charged back to the department from which a call originated. "In 1977, it took more than two weeks for one of our staff members to prepare detailed reports that were sent back to the using departments for charge-back purposes. Today that same job is done in only two days," explained William Brasuell, manager of worldwide telecommunications.

When Brasuell and his staff began to look for a way to upgrade the telephone charge-back system, the only records available were telephone company Station Message Detail Recording (SMDR) details and monthly totals from the Watsbox processor that Fairchild had installed to keep track of Wats calls.

"We needed a system that could combine our two record inputs into an upgraded monthly report so that individual using departments could receive their telephone data faster," Brasuell explained.

Although there was a choice of telephone accounting packages available – even in 1977 – many were not suited to the Fairchild situation since the company already had a Watsbox in operation. After evaluating the possible solutions, Brasuell and his staff decided that the choice was between developing special software in-house or using an outside package called Telecost.

The Telecost software was available from the DMW Group, Inc. of Ann Arbor, Mich. It was designed to use existing toll call data from a variety of inputs and generate a detailed report.

Telecost was written in Cobol, so it was relatively easy to implement on the IBM 370/168 at the Fairchild DP center, Brasuell said. In comparing the benefits of using Telecost or developing an in-house system, it was not possible to determine when the program development people within the company would get to work on the project, he added.

DMW installed the Telecost software in about three weeks on the IBM mainframe. The program was run under the Time Sharing Option, and a remote access terminal was installed at DMW to customize and debug the package online.

Today, Telecost combines SMDR magnetic tapes from the various telephone operating companies where Fairchild has plant sites. This data is added to Watsbox data and calling information on international lines to provide each department with detailed reports a few days after the information becomes available, according to Sandy Rockey, communications supervisor.

Telecost monitors more than 3,000 phone lines plus credit card calls made by company staff members, she added.

The impact of Telecost on monthly phone bills has been significant, Brasuell reported. In 1977, the company bill on domestic calls was running about $35,000/mo; recent bills have been about $25,000/mo.

Although he would not divulge the exact cost of the DMW package, Brasuell said the software cost less than two months' savings in company phone bills.

Department managers use the monthly reports not only for calling information, but also to make sure each number billed is actually used. Before Telecost, it was not unusual for the company to be billed for a phone that was no longer operating, he said.

Now Running on 3033

Telecost now operates on an IBM 3033 which replaced the 168. "We recently took out the terminal at DMW because Telecost had been accepted as a production software system by the Finance Applications Programming Group, which maintains the system," Rockey explained.

Despite acceptance of the program as fully debugged, modifications continue. Brasuell and his telecommunications staff are currently planning to add internal tie-line charges to the monthly reports. This upgrade should be ready early in 1980.

Another addition – further down the road – may be usage detail on Telex and TWX messages. This, he said, will depend on upgrading another Fairchild network to record the necessary information.

This is a CICS/VS test for DP Managers

There are two significant CICS/VS performance analysis software packages on the market. One is Johnson Systems' UTILIZATION MONITOR AND CHARGEBACK SYSTEM. The other is IBM's PA-II. Both provide a method for determining and recovering your CICS cost of operation. Both offer report formats and graphic outputs. Both have been used and tested by hundreds of installations. But . . . one is clearly superior.

Take the test. The answers will surprise you if you want CICS/VS resource control designed to meet your needs.

		JSI CICS/VS	IBM PA-II
1	Which system has up to 100 different easy-to-modify report formats including graphic outputs you can tailor to meet your needs?	A ☐	B ☐
2	In which package is logging limited to one record per transaction?	A ☐	B ☐
3	Which system lets you define your own billing algorithms based on dozens of chargeback variables?	A ☐	B ☐
4	Which package offers user defined logging and space parameters, as well as automatic warm-start recovery?	A ☐	B ☐
5	Which company guarantees complete maintenance support and a super fast enhancement follow-up policy?	A ☐	B ☐
6	Which company offers its product "as is" without expressed or implied warranty?	A ☐	B ☐
7	Which system gives a 30 day "no risk" acceptance period?	A ☐	B ☐
8	Which system offers you an unrestricted number of clocks, counters, and user exits?	A ☐	B ☐
9	Which system does not have a lease-purchase plan so you have to rent by the month, forever, as long as you use their package?	A ☐	B ✓

We answered #9 because, if you are stuck on PA-II, it doesn't have to be forever. You may cancel it with 30 days notice. Other correct answers are 1-A, 2-B, 3-A, 4-A, 5-A, 6-B, 7-A, and 8-A.

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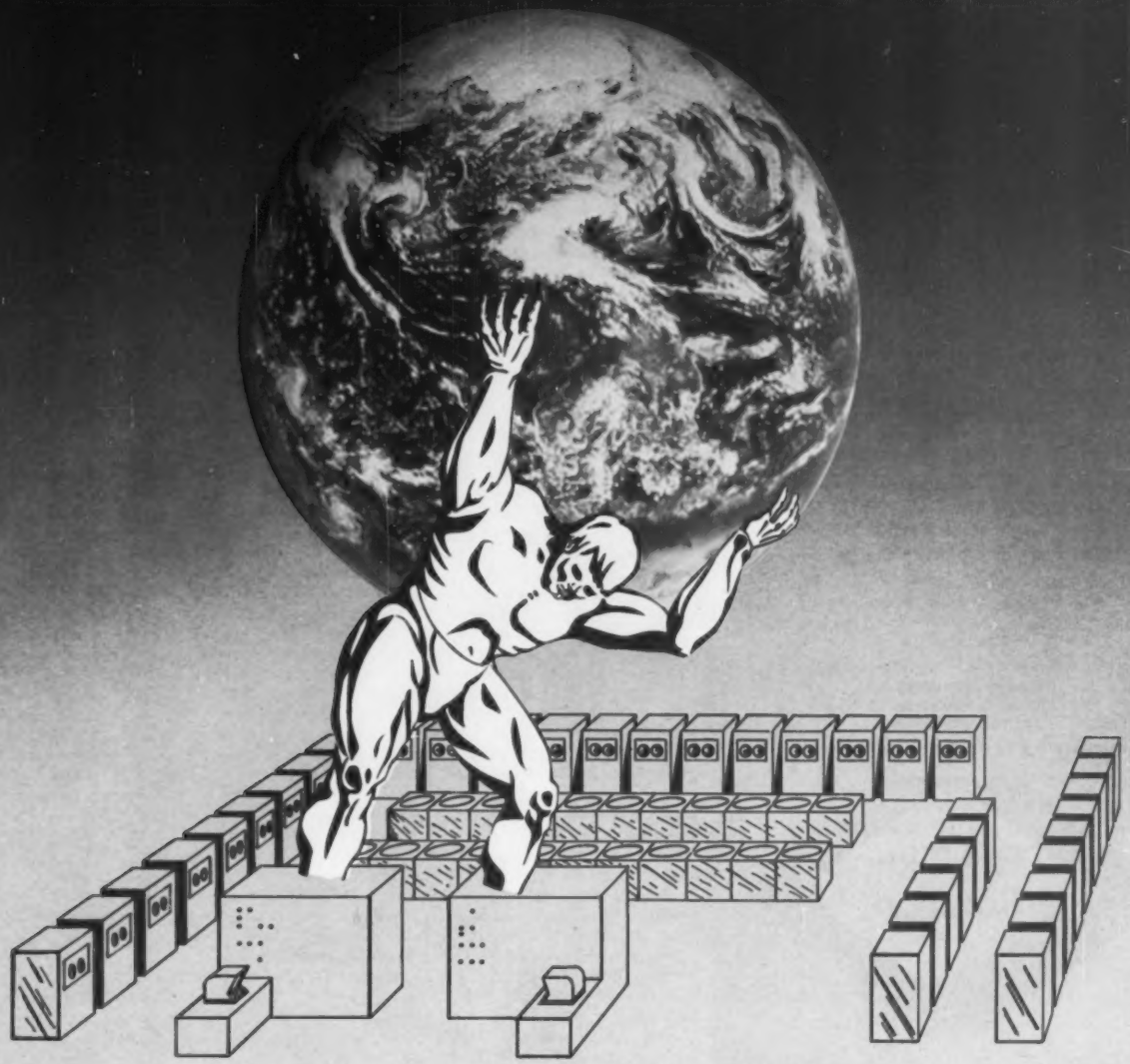

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Software Buyers Urged to Focus on Objectives

(Continued from Page 39)

order or importance relative to the basic objectives of the firm.

Many technically oriented people may balk at this idea. They may say something like, "I want to install a data base management system. How can I relate the advantages of this complex kind of tool to my firm's desire to obtain a 15% share of the canned peach market?"

The most obvious reply is, "If it's not going to contribute to our overall objectives, why should we buy it?" The software package is an investment like any other and must be evaluated in the light of the contribution it will make relative to its cost.

Emphasis on Features

Contrast this emphasis on objectives with the more usual emphasis on features. A user compiles a list of desirable features — with some objective in mind but not explicitly specified — and then determines which products have what features. With some idea of the most important features, the user then tries to decide which product offers the largest number of these.

In some ways, this makes decision making easier, probably because it reduces the problem to one of simply comparing items on a relatively small list of easily obtainable facts. Ultimately, however, the feature-oriented approach oversimplifies the problem and will likely result in serious errors, often because of an inadequate or incomplete list of features, an inadequate basis for ranking features or because the importance of combinations of features were ignored.

For example, features X and Y may rank below features A and B in utility, but combining X and Y may yield greater utility than either A or B alone or even A and B combined.

In addition to these problems, failure to explicitly state objectives and relate them to overall corporate goals is apt to give too much importance to features that contribute mainly to short-term or irrelevant objectives.

For example, features that contribute to user convenience may be weighted more heavily than those that contribute to user effectiveness. A user's effectiveness is increased when he performs the right tasks at the right time, not when he performs the wrong task at the wrong time but does it very efficiently because he is assisted by a software package which is technically very good.

Still other problems may arise by insisting on particular features and so eliminating some software packages from the candidate list merely because they lack a desired feature, even though they may be more than adequate for the task at hand. For example, insisting that a text editing program be capable of deleting a line with a single keystroke means ruling out products that don't have that facility but solve the same problem in a different way — perhaps by allowing the user to delete multiple lines with a very short sequence of keystrokes and without having to position the screen cursor at the beginning of the line to be deleted.

How to State Objectives

Let's look at some examples of very specific objectives. Instead of describing the above requirement as, "The text editor must have a line deletion key," it would be better to say, "The text editor must provide a facility to allow the user — after an orientation time no longer than two minutes — to eliminate 50 lines of unwanted text randomly distributed throughout a sample of 500 lines of text within two minutes and without undue strain or need to rush."

For many applications, a statement of greater scope may be desirable: "The text editor must make it possible for as many as 12 programmers — having only average or below-average typing skills — to simultaneously edit the attached set of five source programs in the ways indicated on those source program listings, each one editing the same set of five programs. The entire group of 12 should be able to complete the task within two hours without undue strain or need to rush. An orientation period of up to one hour per programmer will be permitted."

Note that this example amounts to a benchmark test using a sample of the actual work to be performed. Note also that it does not even specify whether the text editor is to operate in an on-line or batch mode. The emphasis is on obtaining a good solution to the problem at hand, not on specific features of the product.

Specifying objectives of this sort offers several advantages. First, it may help vendors decide if they can in fact come up with creative solutions or should move on to more likely sales prospects and not waste your time.

Second, by relating objectives to a company's overall goals, the corporate decision maker will need to learn about the whole problem and be less likely to jump to premature conclusions about the best type of software solution.

Also, ranking objectives in order of importance both guards against oversimplifying the problem and guides evaluation personnel to consider what is needed to offer the best payoff for the company. Further, this approach helps ensure that vendors tender appropriate solutions and, perhaps, even do some of the evaluation work for you.

Finally, a project clearly related to overall corporate objectives is easier to sell to top management.

Johannsen is president of ABX Automation Consulting Ltd. in Vancouver, B.C. Canada. The firm develops software packages, specializing in DP productivity aids and personnel assessment tools.

'APLSV' Seminar Set in March

ATLANTA — A design seminar focusing on APLSV will take place March 20-21 at the Hyatt Regency Hotel here.

The seminar will address user needs and priorities and has scheduled discussions on Vtam support, batch execution, full-screen IBM 3270 support, performance speed-ups and resource utilization controls.

Registration costs $115 per person. More information is available from the sponsor, Interprocess Systems, Inc., Suite 112, 1260 Winchester Parkway, Smyrna, Ga. 30080.

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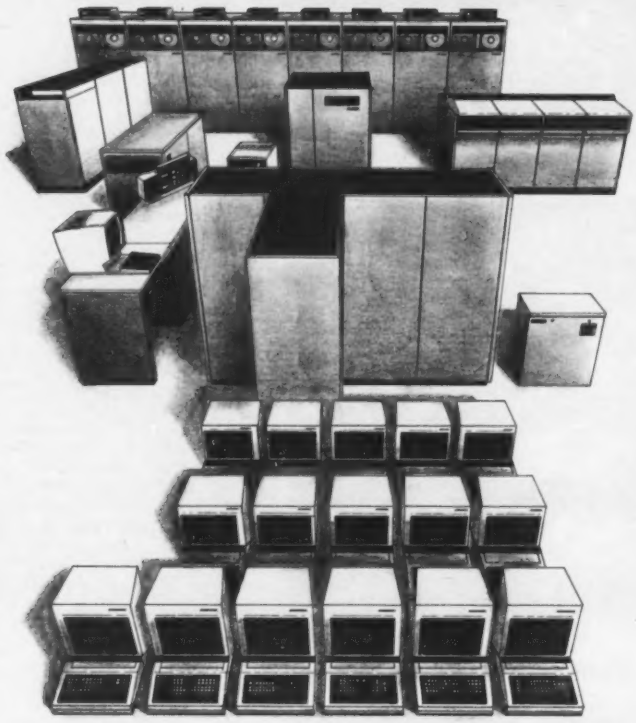

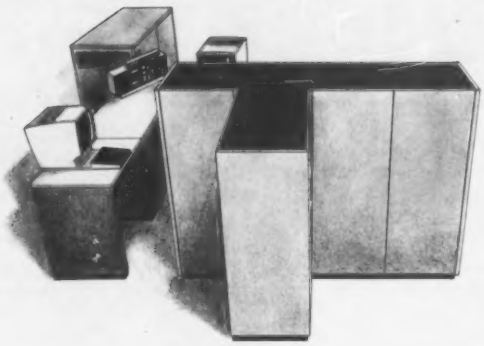

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Prospective Software Users Urged To Emphasize Vendor Support

(Continued from Page 39)

have little trouble answering the recurring questions which originate from new users of the product. It is the vague problem descriptions from a nontechnical end user or queries from a systems programmer about a specific operating system release that test the mettle of a vendor's support staff.

This is not meant to imply that all problems can be resolved via a telephone call. However, proper staffing of the vendor's support group can eliminate many of the frustrations felt by the purchasers and users of the package.

Responsiveness to requests for modifications and enhancements is a good indication of a vendor's concern for client well-being. If there is an active user group associated with the product, contact one of the members for an appraisal of how well the vendor responds to the collective desires of the user community.

A vendor should be just as concerned with the requirements of the established user community as he is with the marketing benefits of new options which serve to broaden the prospective client list. There should be a proper blend of enhancement to the existing package and development of new options and functions.

Modification Details

If specific modifications are required for your installation, be sure the details of the modification have been well thought out. The best technical staff available can only be expected to produce that which is specified, preferably in writing.

Also, be cautious when implementing installation-dependent modifications. Ensure that the implications of having a "prototype" version of the package do not invalidate any warranties or agreements regarding new releases.

For the protection of both your organization and the vendor, insist that any stipulations concerning special modifications be specified and agreed upon in writing. This will eliminate the possibility of misunderstandings which can be costly for both parties.

Beneficial Relationship

Finally, once you have chosen and installed the package, begin to develop a relationship with the vendor which will be mutually beneficial. People frequently have a tendency to believe that their problems, solutions and new ideas are particular to their own organization and not of interest to anyone else.

Experience with various vendors has proven this to be a false assumption. Most vendors are quite receptive to constructive criticism and to ideas concerning product enhancement.

Advantageous Move

Development of a working relationship which extends beyond the normal client-vendor relationship could prove to be the most advantageous move you can make when dealing with a software package and its vendor.

Downes is manager of development programming at the Coca-Cola Co., in Atlanta, Ga.

DEC, Data General, H-P communications costs are down

If you're supporting multiple remote terminals on your minicomputer system, whether from DEC, Data General, HP or anyone else, chances are you are paying a fortune in communications costs and probably not even running the terminals as fast as you'd really like to. And to add insult to injury, you have to put up with the occasional phone line 'glitch' which drives your CRT's crazy.

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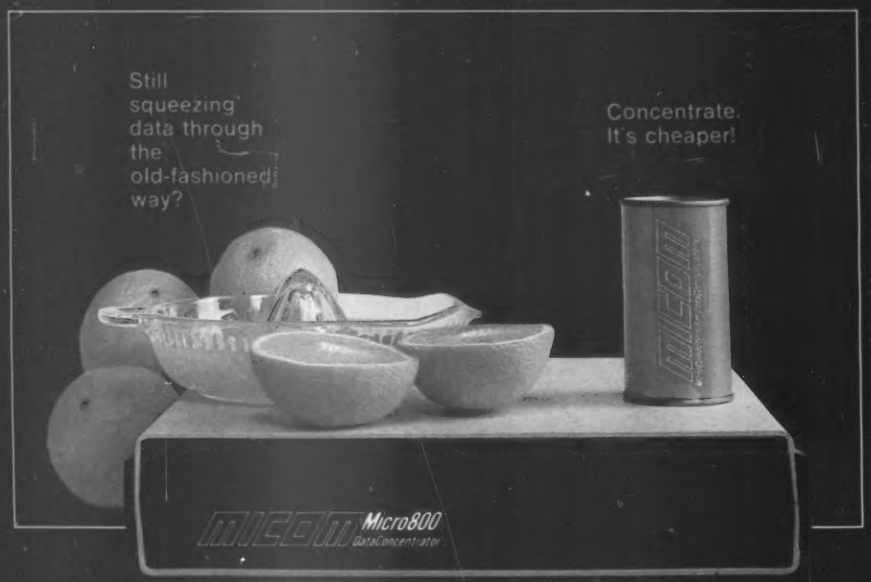

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For Large-Scale Use

Burroughs Unwraps Net Processor Series

DETROIT — Burroughs Corp. has unwrapped a series of communications processors for use in linking remote DP operations with each other or with central computers to form large-scale communications networks.

Initially, the CP series will include two processor levels — the CP 9400 and the more powerful CP 9500. The latter features four independent processing elements, a spokesman said. Each element is dedicated to a different set of functions.

One element of the 9500 provides operating control, another element manages data files, a third module compiles and runs the user's applications software and data communications is assigned to the fourth module.

The so-called elements run concurrently, each at its maximum rate of throughput, the spokesman said. As a result, the 9500 is said to employ all of its resources "at peak efficiency continuously."

Burroughs credited the fourfold architecture with giving more performance per dollar than earlier systems.

Both CP models can serve networks of both Burroughs and non-Burroughs host systems and terminals, or as communicating stand-alone processors to support peripherals, the spokesman stated.

The 9500 system tops Burroughs' CP series of communications processors for large-scale networking.

The 9500 was reportedly intended for use as a host CPU within the Burroughs Network Architecture.

The CP series can benefit users who retain centralized DP operations but want to equip field sites with terminals and such other remote processing devices, the source added.

Two series of disk drives, flexible and fixed, were announced with the CP 9500. The flexible disk line was said to provide up to 6M bytes of on-line storage for applications programs, data and systems maintenance information. The fixed disk series can reportedly hold 19M, 38M or 77M bytes in a single cabinet.

(Continued on Page 48)

Accounting Firm Counts on Terminal

By Jay Woodruff
CW Staff

NEW YORK — While an accounting firm here has been enhancing much of its small communications network, one piece of equipment — a three-year-old data collection terminal — is reportedly working just fine.

Main, Hurdman and Cranstoun (MH&C) provides accounting services to more than 40,000 clients out of 79 offices in the U.S. and in four branches in London, Hong Kong, Geneva, Switzerland, and Brussels, Belgium.

Eight regional offices in the U.S. use terminals to send client accounting data to the New York headquarters, where it is prepared for processing at service bureaus.

In New York, a Mitron Systems, Inc. MDRS-9 data collection terminal, with an integral tape drive, gathers information from the eight offices. In three years, it has never broken down or needed service other than routine cleaning by members of the company's DP staff, according to Janet Chaklos, DP director.

Not all accounting data arrives at the firm via terminal communication to headquarters, however. Many of the small branch offices mail in manually prepared data, where it is entered onto computer tape and made ready for processing at one of the service bureaus.

Offices outside the U.S. also mail in their reports now, after finding that setting up a digital communications system was too expensive, Chaklos said. All mailed data is transferred to tape in New York using eight CRT terminals connected to a Four-Phase Systems, Inc. 180K-byte minicomputer.

Regional offices communicate directly over phone lines from their own Texas Instruments,

(Continued on Page 56)

Following IBM's Lead

Tran Backs New CCITT Standards

By a CW Staff Writer

MARINA DEL RAY, Calif. — A vendor of data network products has announced it will support two recently proposed international networking standards that are expected to make data communications in the 1980s simpler and less expensive than they were in the 1970s.

The prospective standards are known as Recommendations X.20 and X.21 of the Consultative Committee on International Telegraph and Telephone (CCITT). According to Tran Telecommunications Corp. here, X.20 and X.21 are terminal-to-network standards for asynchronous and synchronous transmissions, respectively.

To date, Japan is the only nation using X.21, according to a spokesman for IBM, which announced last December it will support that particular CCITT proposal on a worldwide basis.

As Tran and other network product vendors join the world's largest mainframer in endorsing X.20 and X.21, "we can all begin saying good-bye to standards . . . RS-232C [set by the Electronic Industries Association (EIA)] and CCITT V.24," the Tran source said.

X.20 and X.21 "specify basic, electronic and circuit-level connections equivalent to those defined by the combination of EIA standards RS-232C and RS-366, and by the combination of CCITT international standards V.24 and V.25," a Tran Spokesman said.

"However, the new recommendations are vastly simpler than

(Continued on Page 48)

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Versatec Controller Compatible With IBM 3780s

SANTA CLARA, Calif. — A remote plotting controller is available from Xerox Corp.'s Versatec subsidiary to emulate IBM 3780 data communications terminals and add a remote electrostatic capability to any Versatec printer/plotter.

The Model 440-20 Bisync Remote Plotting Controller is supported by Versatec's Versaplot software on the host computer system. Under Versaplot, input data is processed and compressed, then transmitted over data communications lines to the 440-20, a spokesman said.

A plot compression algorithm can pare the duration of transmission to less than 4% of the time consumed with ordered vector compression, he claimed.

On request, the 440-20 transmits pre-defined "sign-on" or inquiry card images to one or more host computers. The controller carries its own data-link trace facilities and self-test diagnostics, the spokesman added. Synchronous serial RS-232C data is input at rates in the 2,400 to 19.2K bit/sec range.

IBM-Compatible

Written in Fortran, the Versaplot software was called fully compatible with IBM mainframe software and communications protocols. The package fits OS, VS and CMS operating systems for IBM's 360 and 370 mainframe families, the Versatec spokesman maintained.

The 440-20 can drive printers with paper as wide as 72 in. at a top print speed of 1,200 line/min. and a top plot speed of 34 sq ft/min. Remote plotting performance varies with the speed of the communications line and plot complexity, the spokesman explained.

With optional hard copy controllers, Versatec printer/plotters reportedly can supply hard copies from Tektronix, Inc. terminals and Hewlett-Packard Co.'s 264X CRT terminal family.

The 440-20 controller costs $6,500 in the U.S. Versatec plotters start at $7,900, the vendor noted from 2805 Bowers Ave., Santa Clara, Calif. 95051.

Net Processors Unwrapped

(Continued from Page 47)

To support the CP 9400 and CP 9500, Burroughs has introduced a software package called the Transaction Control System (TCS). For use in on-line transaction processing, TCS includes a Master Control Program (MCP), Network Definition Language (NDL), Generalized Message Control System (Gemcos) and Message Programming Language (MPL).

NDL generates data communications control programs; Gemcos supports message handling; and MPL backs communications application software, the spokesman said. The monthly license fee for TCS is $120.

Current users of Burroughs' Computer Management Systems (CMS) application software and Computer Management Distributed Information Software (CMDIS) on the vendor's B80, B90, B800, B1800 and B1900 systems can run those programs without modification on the CP 9400 and 9500.

CMDIS reportedly provides program-to-program communication between computer systems, among other capabilities.

The CP 9400 and 9500 come with main memory ranging from 96K to 640K bytes and ports for two to 32 communications lines, the spokesman noted.

A typical CP 9400 configuration would include 96K bytes of memory, a 1M-byte Burroughs Super Minidisk drive, 18M bytes of cartridge disk storage, two data communications lines and an operator console. That system costs $26,500 or can be leased on a three-year plan for $736/mo.

A typical CP 9500 would include 384K bytes of main memory, dual flexible disk drives with 6M-byte capacity, 77M bytes of fixed disk storage, four data communications lines and an operator console. A 9500 goes for $36,029 or can be leased on a three-year plan for $1,092/mo.

The lease rates include around-the-clock, seven-days-per-week field engineering service, the spokesman pointed out. Deliveries are scheduled to begin this quarter of 1980.

Burroughs' world headquarters is in Detroit, Mich. 48232.

CCITT Standards Endorsed

(Continued from Page 47)

the earlier forms they will be replacing. For example, they call for 15-pin instead of 25-pin connections," he added.

IBM Direction

IBM's support for X.21 should benefit the communications user in general and the IBM customer in particular, the Tran Source maintained.

"For years it had seemed that IBM's product direction was away from simple terminals, away from X.25-compatible packet switching and toward more complex and more expensive [devices compatible with the vendor's Systems Network Architecture].

"That direction has now been somewhat altered," he claimed.

Because X.21 specifies a simpler breed of commnications hardware, the user can expect a significant drop in communications hardware costs — in some cases to one-third the costs of currently sold equipment — as vendors rally around the new standard, the Tran spokesman indicated.

Computer and terminals makers are also expected to offer X.20 and X.21 support for existing hardware, he continued. "This will mean longer lifetimes for existing products as well as the prospect of smaller expenses for new equipment when it is finally required."

Two-Part Standards

Both standards have two parts, the Tran spokesman explained. One part reportedly relates to replacing RS-232C and CCITT V.24 interfaces with simpler and less expensive alternatives.

"In this respect, the new standards are seen as forming a basis for other higher level standards," he observed. "The higher level packet-switching standard called X.25 will eventually incorporate X.21, as will others."

The second part of X.20 and X.21 was called even more important. That portion would replace the old RS-366 and CCITT V.25 switched network interface standards, which specified two distinct physical connections for a computer or terminal in order for them to access a switched network such as the public telephone system.

"Now, a device with the full capability of X.20 or X.21 will be able to access such a network automatically through a single, simpler interface," according to the Tran spokesman.

Aside from backing the new standards, Tran's M3200 series of network processors and network access concentrators will continue to support current standards RS-232C, RS-366, V.24, V.25, V.35, X.25 and Mil 188.

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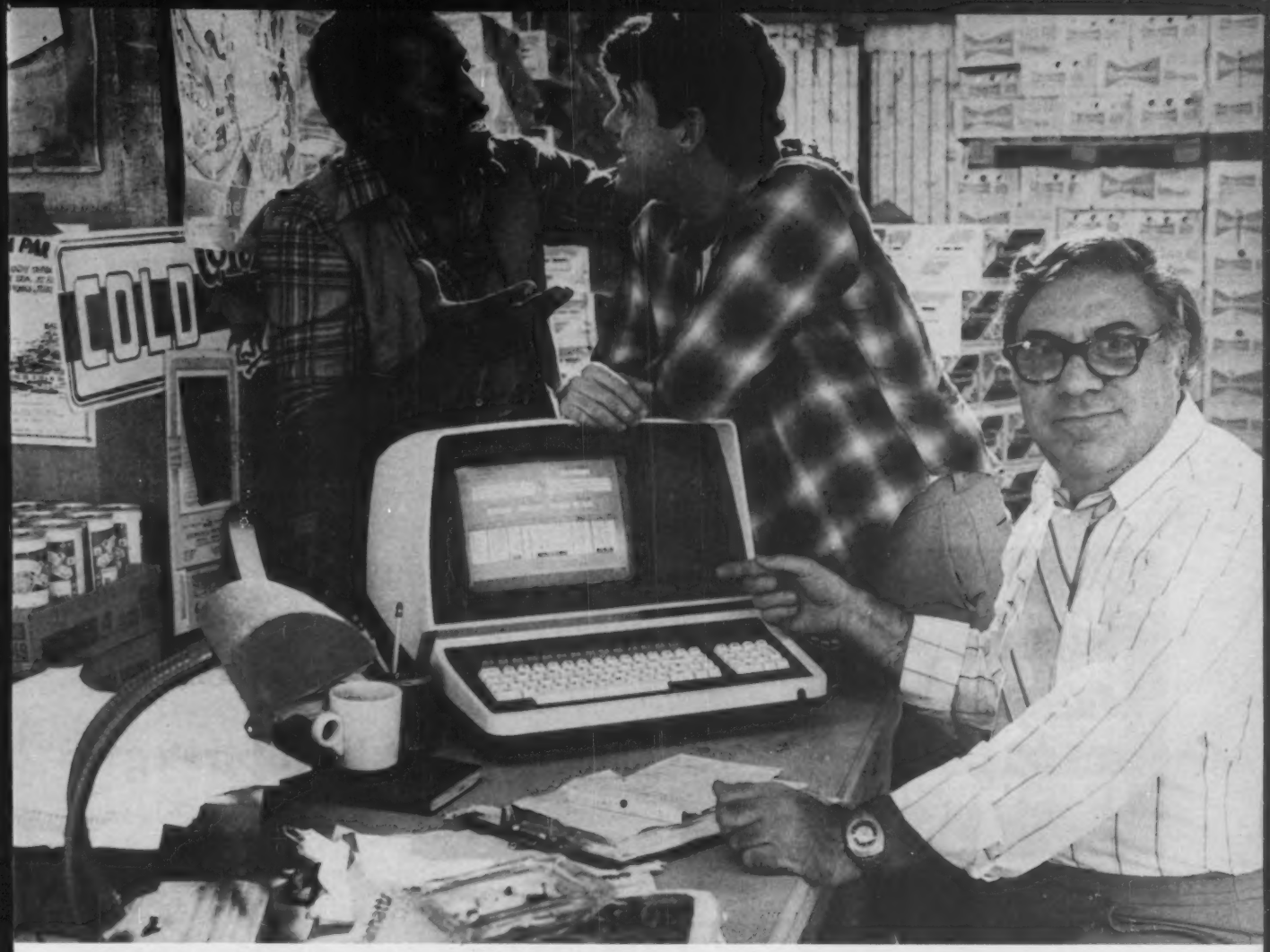

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But these two new terminals from ADDS offer more than visual sophistication. Each provides a 14-key numeric pad to streamline data entry. Also 8 function keys, 5 cursor control keys, and an auxiliary port control key. And both have a 25th line—a "status line" that lets the user see the state of the terminal.

Regent 60 offers the further advantage of buffered transmission and additional editing capability.

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Via RS-232C Interface

Encryption Units Guard Asynchronous Data

PALO ALTO, Calif. — A pair of encryption devices that, via an RS-232C interface, can safeguard asynchronous communications between the user's terminal and computer system is available from SPI Data Systems, Inc.

Conforming to the federal Data Encryption Standard (DES), the Datalock 150 and 250 cryptographic units can accept commands from both the terminal and the host system, a spokesman said. The units' switch-selectable range of transmission speeds is from 110- to 9,600 bit/sec.

The user can input plaintext into the terminal and have it encrypted by an attached Datalock prior to transmission through a network or prior to storage in computer memory, the spokesman continued.

Conversely, encrypted data retrieved from the computer or received through the network can be decrypted by the Datalock on its way to the terminal.

SPI Data said typical applications might be: protection of financial and accounting data, personnel data, research and development results, medical histories, credit information, electronic funds transfers and sensitive government data.

In contrast to at least some of the other DES-compatible encryption units on the market, both Datalock models feature a command set that allows start and stop of the cryptographic process at user-specified points during data entry.

In addition, trigger commands may be inserted by either Datalock model into the encrypted data stream to induce automatic decryption when the data is later retrieved, the spokesman added.

The user's encryption key is entered through the terminal at the beginning of the session, he noted. Once entered, the key is reportedly inaccessible "by any means."

The Datalock 150 from SPI Data Systems, Inc.

The Datalock 250 costs nearly $600 more than the Datalock 150, but offers additional capabilities that are said to allow sharing of encryption resources by different users and system utilities.

For example, the Datalock 250 allows dynamic changing of the encryption key to accommodate different users without compromising security, the spokesman indicated.

A bisynchronous version of the Datalocks will be available in April, he added.

The Datalock 150 and 250 cost $2,390 and $2,950, respectively. SPI Data's address is 488 Cowper St., Palo Alto, Calif. 94301.

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Seminars to Probe IBM Strategy

CAMBRIDGE, Mass. — IBM's strategy in the data network arena is "to ride the technology curve and to leverage its dominant EDP industry position," according to the Yankee Group, which will hold seminars on that strategy in coming months.

Slated for February 13-14 in Palo Alto, Calif., and March 25-26 in New York, the seminars will discuss what Yankee Group sees as the threefold basis for IBM's campaign.

IBM's first tactic is "to extend the efficiencies of its mainframe computer business," the research firm maintained. The goal of this tactic was said to be "the care and preservation of the hierarchical host-oriented computer net."

The mainframer's second tactic is "to counterpunch the distributed data market with a variety of products that focus on coherent networks, and specifically on the 'satellite' processor," the Yankee Group said.

The point of that would be "to regain and redirect the ability to lead its customers' computing direction," according to the Cambridge-based company.

Finally, Yankee Group said that IBM's third tactic is "to prime the pump for a new generation of computing applications."

The third tactic's objective is "to enhance programmer productivity through [data base management systems] so that new software development can proceed without program maintenance bottlenecks," the firm claimed.

Registration costs $650 per person, including meals and a Yankee Group "research manual." Inquiries should be addressed to the Yankee Group, Harvard Square, P.O. Box 43, Cambridge, MA 02138.

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Burroughs Offers Encryption Chip

DETROIT — Burroughs Corp. has entered the encryption chip arena with an N-channel silicon gate circuit that conforms to the federal Data Encryption Standard.

The MC 884 chip encrypts or decrypts 64 bits of data per encryption cycle, based on a 56-bit key variable stored in the key register of the chip. Once loaded into the chip, the variable cannot be accessed, a spokesman said.

A battery option may be used to prevent destruction of the key variable should power fail. The key bytes are checked for odd parity, but a parity error does not affect the chip's operation, the spokesman added.

Burroughs is selling the MC 884 in OEM quantities at $60 each through Burroughs OEM Marketing Corp., a subsidiary, located in Burroughs Place, Detroit, Mich. 48232.

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MDB Puts Line Printers At a Distance

ORANGE, Calif. – Most printers connected to MDB Systems, Inc. line printer controllers can reportedly be operated at distances up to 3,000 ft. with MDB's Parallel Long Line Adapter Option Box.

The adapter can also be used with controllers from computer manufacturers and to tie peripheral devices such as card readers to the computer over long distances.

Long-line capability was previously available with MDB printer controllers for the Digital Equipment Corp. PDP-11, and for Perkin Elmer Corp., Data General Corp. and Hewlett-Packard Co. CPUs. It is now further extended to MDB controllers for the DEC PDP-8 and LSI-11 and IBM Series/1 to operate printers from Centronics Data Computer Corp., Dataproducts Corp., Data Printer Corp., General Electric Co. and Printronix, Inc.

The adapter costs $525. Those printers without the required long-line adapter circuitry must order MDB's Long Line Paddle Board ($200), or a second adapter box.

Computer-to-adapter-to-printer cables cost extra, MDB said from 1995 Batavia St., Orange, Calif. 92665.

Terminal Has Touch Screen

CHAMPAIGN, Ill. – A Teletype-compatible CRT terminal that interacts with the user when its screen is touched has been developed by Carroll Manufacturing Corp.

Designed for interactive applications, data entry, information retrieval or any related data communications requirements, the Touch Terminal is operated when a user touches the surface of the screen, causing the coordinates of the "touch point" to be communicated to the host computer.

The microprocessor-controlled Touch Terminal is programmed with self-test programs. It can detect invalid hits during system operation.

Carroll is a spin-off of the University of Illinois and provides Touch Input systems for the university's well-known Plato teaching project. The Touch Terminal costs $2,600, the vendor said from 1212 Hagen St., Champaign, Ill. 61820.

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TransCanada to Store and Forward

OTTAWA – The TransCanada Telephone System will unveil a public store-and-forward message service in late 1980 through its Computer Communications Group (CCG).

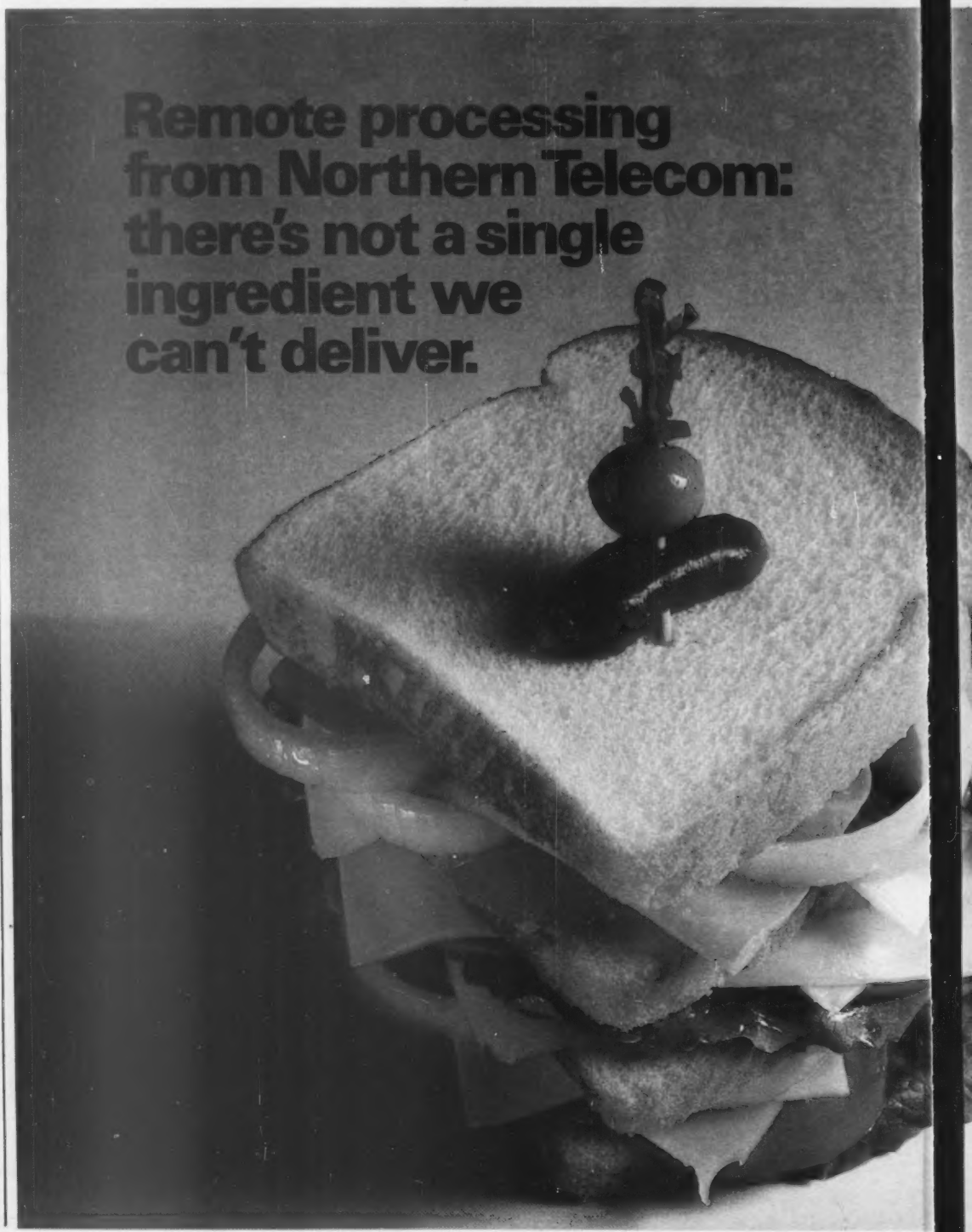
Envoy 100 will be offered throughout Canada to users with Ascii terminals communicating at speeds of 110- to 1,200 bit/-sec. The capability was designed to allow economical use of CCG's computers by small and large organizations with low or high message traffic volume.

To Telenet, Tymnet

The service will accommodate users of CCG's existing Message Switching Data Service and can be used to communicate through established North American gateways to users on the GTE Telenet Communication Corp. and Tymnet, Inc. packet networks, CCG added.

Envoy 100 will reportedly use Datapac, the Canadian packet-switching network, as its prime communications medium. Terminals connected to Datapac via 3101 access lines, as well as terminals on the TWX and Dataphone network, can send and receive messages from Envoy 100, according to CCG.

CCG will file for tariffs for the service this summer with the Canadian Radio Television and Telecomm Commission.



Nets of 3270s Analyzed

NORWALK, Conn. — A response time analyzer has been unveiled that measures the performance of networks using IBM 3270 or 3270-compatible terminals.

The RTA-327 from Datacomm Management Sciences, Inc. is said to permit simultaneous measurements of the entire network circuit or of specific controllers, terminals or software applications.

All measurements are made at the CPU or remote controller on a bridged — in service, noninterfering — basis through the RS-232C interface between the communications controller and modem equipment, the vendor said.

The RTA-327 costs $4,875. Datacomm is working on a version to support IBM's Synchronous Data Link Control, it said from 181 Main St., Norwalk, Conn. 06851.

Comm-Stor Gains Editing Aid

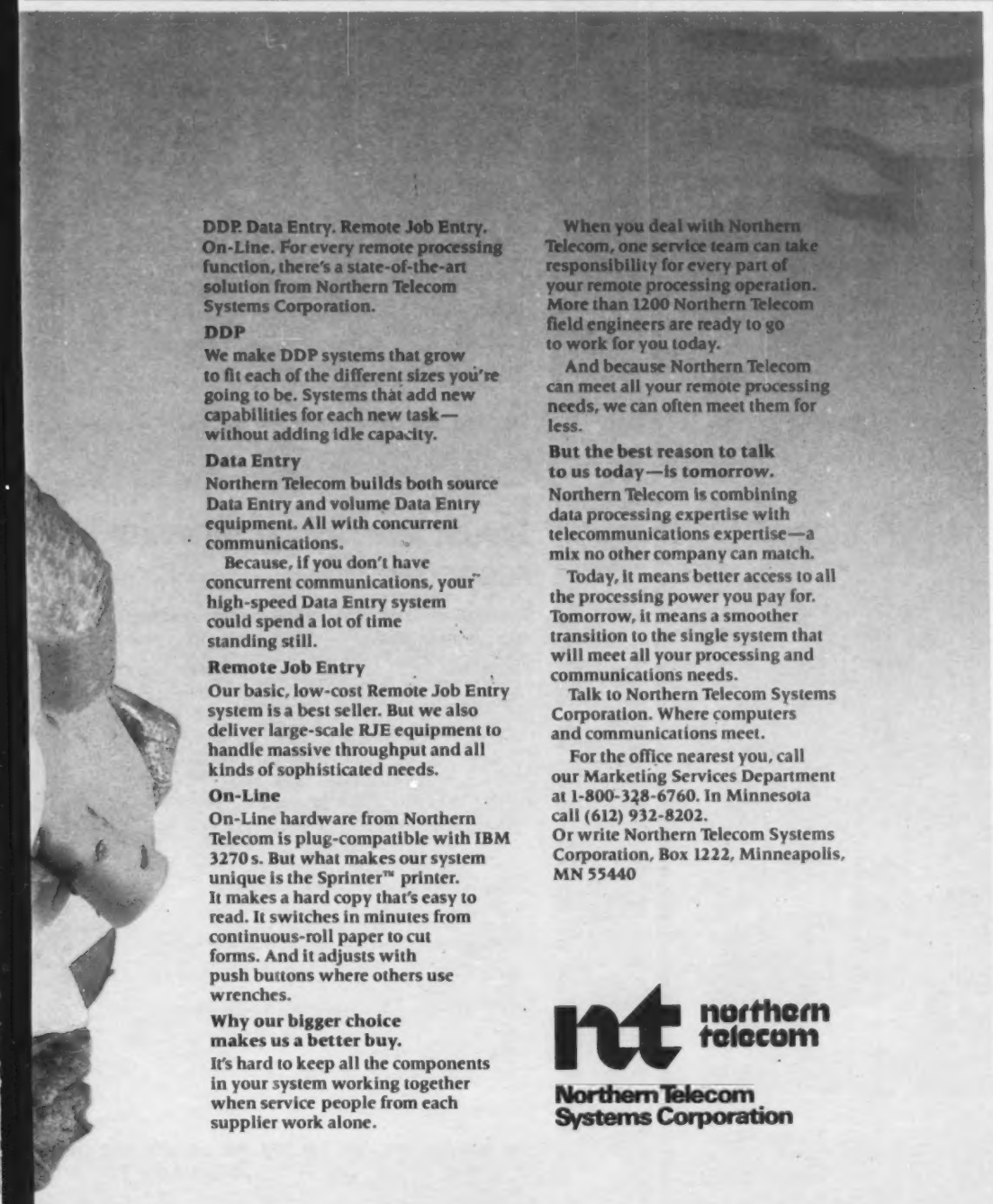
ROCHESTER, N.Y. — Users of the Sykes Datatronics, Inc. Comm-Stor II storage unit and Comm-Stor III communicating forms entry station now have an updating and revision package to expand off-line message preparation.

Sykes' Extended Editor reportedly allows an operator to edit large files, inserting characters or complete lines of data, appending or deleting lines and replacing specified character strings. It appends data from one or more existing files into another file and can format individual paragraphs of existing text by setting new left and right margins, the manufacturer said.

A file can be read into the Extended Editor from diskette and displayed on a terminal. After making the appropriate changes on the data file, the user stores the edited version on diskette; the file can then be displayed on the terminal, sent to a remote device or printed, according to Sykes.

The Extended Editor can also reformat new data as it is entered from the terminal by setting left and right margins and tabs and can establish page boundaries with top and bottom margins, the vendor said.

The Extended Editor costs $250, but is included at no charge with the firm's Comm-Stor IV storage unit. Sykes is at 375 Orchard St., Rochester, N.Y. 14606.



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Seminar Set In Worcester On Networks

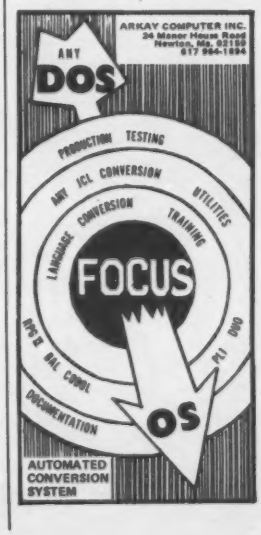
WORCESTER, Mass. — A two-day seminar aimed at helping managers configure cost-effective data communications networks will be held three times in the first half of this year by Worcester Polytechnic Institute here.

The seminar will begin by defining the place of data communications — its requirements and constraints — and familiarizing participants with crucial terminology and concepts.

Trends, the effect of the newest communications laws and available services will also be discussed. Information on communications software and hardware will be presented.

Basic problems in maintaining the system integrity and the proper equipment to use to solve those problems are to be covered by Robert J. Kaufman, manager of telecommunications services for Damon Corp.

The seminar will be held Feb. 7-8, March 20-21 and May 12-13 at the institute. It costs $375. More information is available from Ginny Bazarian, Office of Continuing Education, Worcester Polytechnic Institute, Worcester, Mass. 01609.



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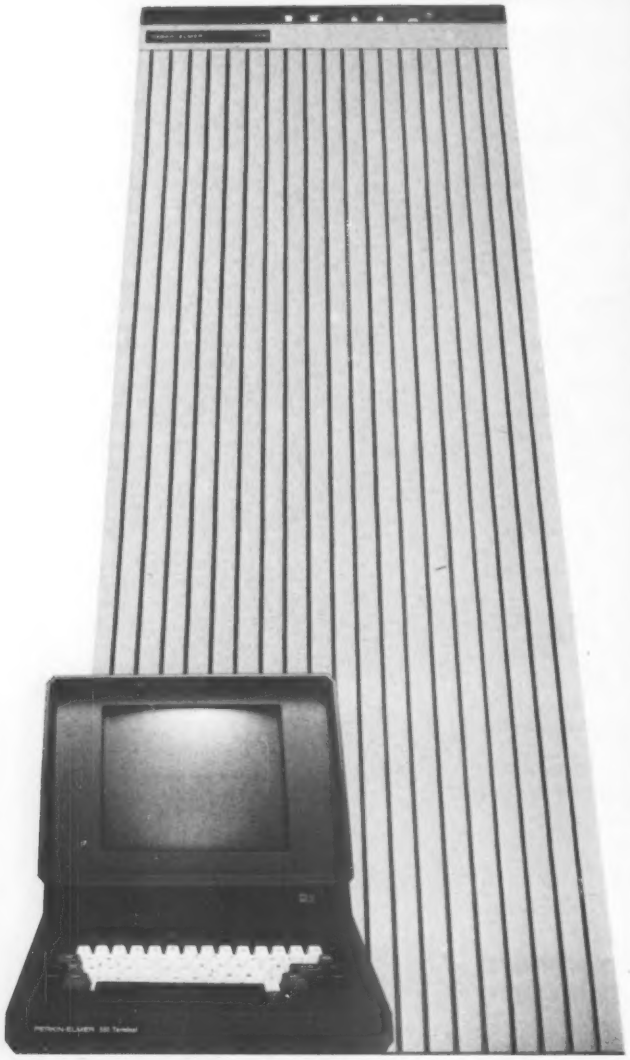

*System prices start at $125,500 (OEM quantity 1) which includes 512 KB of memory, writable control store, floating point processor, battery back-up, Model 550 console terminal, 80 MB disc, and 75 ips/800 cpi tape. Prices are U.S. only.

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Megadata Unveils Workstation

BOHEMIA, N.Y. — A workstation for data communications and word processing is available from Megadata Corp.

The vendor's 700/RTE station is aimed at applications requiring two separate functions in a single system: stand-alone processing and remote DP.

In the communications mode, the 700/RTE's 80-char. by 20-line screen features a 7 by 9 dot matrix. The word processing mode generates an 8 by 12 dot matrix.

Called fully programmable, the dual-drive 700/RTE has a disk capacity of 80,000 bytes per minifloppy for a total of 160,000 bytes. The memory structure has a 512-byte bootstrap loader on programmable read-only memory and 64K bytes of random-access memory.

The 700/RTE costs $8,000, including a 55 char./sec daisywheel printer. OEM discounts are available. Megadata is located at 35 Orville Drive, Bohemia, N.Y. 11716.

Color CRT Displays Up to 300 Lines

COLUMBUS, Ohio — A 19-in. color CRT offering a 200- to 300-line display of 450 to 650 dots is available from Industrial Data Terminals Corp.

The IDT-19A operates with an RS-170 input either in an interlaced or noninterlaced mode and has a flicker refresh rate of 60 Hz.

All electronic controls are located in a display panel that is normally mounted in a drawer for front access.

The IDT-19A can be ordered in a cabinet for $2,695, in a 19-in. rack mount for $2,645 and as a wire frame (OEM) model for $2,395.

A high-resolution optional CRT is available for an additional $2,100. Spacing between masking on the optional screen is reduced from .61 mil to .31 mil, the vendor said from 1550 W. Henderson Road, Columbus, Ohio 43220.

Cost Cut on AJ 630

SAN JOSE, Calif. — Anderson Jacobson, Inc. has lowered the lease price and purchase cost of its 30 char./sec thermal printer terminal.

The AJ 630 — a full Ascii system with a 140-col. carriage — now lists for $995 and leases for $53/mo on a three-year term, including maintenance, the firm said.

More information is available from Anderson Jacobson at 521 Charcot Ave., San Jose, Calif. 95131.

Accounting Firm Depends On Three-Year-Old Unit

(Continued from Page 47)

Inc. TI742 programmable terminals to the MDRS-9 at headquarters. Their work load includes work that has been sent in from some of the smaller branch offices in the area, according to the DP director.

The offices send in general ledger statements once a week, while time and expense statements, which show how much time has been spent on each account, are sent in bimonthly.

The regional offices have had their TI742's programmed to facilitate regional data entry, using programs stored on cassette. Operators enter the time and expense information, for example, onto another cassette, the contents of which are sent to New York. These offices also route manually prepared data through the terminals from some of the nearby branch offices in the region.

Asynchronous Data

The accounting firm acquired the MDRS-9 specifically to collect asynchronous data from the regional offices. The MDRS-9 receives the data over phone lines at 1.2K bit/sec using Bell 202 modems. The information is recorded directly onto the Mitron's nine-track tape drive, which was doubled in size from 800 bit/in. last spring.

To make sure that the regional offices can get their data through to the main office on time, MH&C supplies each with 300 bit/sec acoustic modems in case of a failure of the 1.2K bit/sec modems, Chaklos indicated.

The Four-Phase mini was designed to talk bisynchronously with the service bureau's IBM 3033 mainframe. "We didn't want it to talk [asynchronously] with the regional offices because it would downgrade the minicomputer's performance," Chaklos said.

Service Bureaus

Tapes prepared on the Four-Phase system and the MDRS-9 are then physically carried to Home Insurance Co. in New York, where they are processed on an IBM 3033 mainframe. However, Home Insurance is "trying to get out of the service bureau business," Chaklos said, which has prompted MH&C to try Datamor, a service bureau that runs as a division of Korvette's Department Stores.

The accounting firm has set up a time-sharing remote connection to the service and plans to set up a remote job entry (RJE) system that will obviate the need to carry tapes and reports back and forth between the firm's headquarters and the service bureau, the DP director said.

Until the RJE system is online between the two locations, MH&C is having some of the reports printed at the service bureaus, and the rest put on tape for printing back at headquarters.

Wherever the reports are printed, they are all eventually mailed back to the branches. However, the firm has taken another step toward streamlining the return of the report data to the branches.

As the leases on the TI742 run out, MH&C plans to replace them with Durango Systems, Inc. F-85 minicomputers with communications capabilities.

At present, the firm cannot return the reports as efficiently as it has received them because the TI terminals utilize thermal printers. With no perforations or forms marking, they are not adequate machines for generating permanent records, Chaklos explained.

The one-piece F-85s, on the other hand, incorporate a 165 char./sec impact printer, which means reports sent to the regional offices can be transmitted electronically instead of mailed.

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New York City Gets Finances in Order

By Andy Borno
Special to CW

NEW YORK — Midway through fiscal 1978 it became clear that $26 million of New York City "reserve" funds would not be needed. The amount was immediately freed for use. (A "reserve," which covers monies that fail to materialize, is designed to keep the city from spending money it never had to begin with.)

The city's financial experts were able to spot this fact because of the accurate, up-to-date "fiscal intelligence" provided by New York's Integrated Financial Management System (IFMS) which, by that time, had been in operation about half a year [CW, Sept. 19, 1977].

"That alone paid for the system," according to David G. Woodbridge, executive director of the city's Financial Information Services Agency (Fisa), which runs IFMS and interacts closely with the agencies served by the system. "It happened because IFMS provides more detailed information on revenues."

Revenues such as taxes, licenses and fees are recognized on a cash basis and recorded prior to actual receipt only when they are "known and measurable." In general, this means the system permits accrual of state and federal aid revenues when an invoice or claim has been submitted to the grantor.

An important feature of the IFMS budget structure is that the revenue and expense budgets are separate. They are linked only by cross-referencing, to show where changes in one affect the other.

This was done to eliminate any confusion between the two budgets, help assure proper control and allow for monitoring of earnings and receipts on a detailed basis. The separation also provides for citywide balancing of income and expenditures without implying, as did the previous budget structure, that the agency receiving certain revenues is automatically entitled to spend them.

"These features, especially the monitoring of earnings and receipts on a detailed basis, were in major part responsible for the freeing of $26 million in disallowance reserves," Woodbridge said.

IFMS' budget structure is on an organizational basis, so budget lines reflect real entities such as police precincts, fire commands and service delivery components. At the same time, the system also computes the cost of programs that cut across organizational lines.

Fiscal Credibility

Even more important, in the long run, is the city's new fiscal credibility.

"In the first quarter of this year, New York City successfully completed two note sales totaling $275 million within the space of three weeks," Woodbridge said. "Since then, more notes have been sold without the requirement that they be underwritten by a third party. The city is once again rated in the money market, and there has been talk

(Continued on Page 58)

David G. Woodbridge, executive director of New York City's Financial Information Services Agency, is responsible for what is considered the largest municipal financial control operation in the world.

IBM Scientists Move Toward VLSI Circuits

YORKTOWN HEIGHTS, N.Y. — IBM scientists here have come up with a better way of packing logic circuits onto a silicon chip that could lead to development of a very large-scale integrated (VLSI) circuitry.

IBM has built experimental circuits that show high switching speeds of .8 nsec. The experimental circuits also show a higher packing density, increased by a factor of 2, and a low power consumption, according to IBM.

The denser circuit is called a merged transistor logic (MTL) or integrated injection logic circuit. That is a modified version of the silicon bipolar junction transistor, the one now used in most mainframes.

Scientists have looked at the MTL circuit for some time as a possible way of improving upon current computer technology. In the past, however, whenever an MTL circuit was built with bipolar technology, the result was an extremely slow circuit with a switching speed greater than 3 nsec.

The IBM scientists, however, have come up with a more efficient way of building an MTL circuit to achieve a switching speed of about .8 nsec. The new process keys on providing low power resistance paths that do not store electrical charges. Large areas within a circuit that store electrical charges was the major obstacle in limiting switching time, IBM said.

Self-Alignment Gained

In addition, the IBM process automatically defines the places in the silicon layer where crucial holes to mount logic circuits should be placed. This eliminates the need for precise alignment tolerances, which makes the switching speed even faster.

As an added bonus, the process allows scientists to pack circuits twice as densely, IBM said.

With the self-aligning process, the top collectors of NPN transistors are doped from and contacted by arsenic-doped n+ polysilicon lines. The collectors are then butted against the recessed oxide isloation.

More Favorable Ratio

The extrinsic base regions between the n+ collectors are stitched together with an aluminum overlay so the base contacts are self-aligned to the collector edge.

This type of structure provides a more favorable ratio of collector area to emitter area without changing the collector size, IBM said.

The scientists could not say when the MTL circuit will be used in a commercial product.

Instant Cure for Computer Indigestion

The Beall Channel Switch. Directs critical on-line services to another CPU when failure occurs. Allows specific peripherals to serve more than one computer. Redrives all CPU signals to give you far more flexibility for physical placement of peripherals.

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New York Integrates Financial Data Centers . . .

(Continued from Page 57)

of a bond issue.

"This is a complete turnaround from 1975, when a change was mandated in the city's accounting and budgeting systems," he added, "and from July 1, 1977, when IFMS went into operation in response to that mandate. New York City today — barely two years later — has credible financial statements.

"That means the IFMS is meeting the objectives set for it. More than just a reaction to a mandate, it is a positive and innovative answer to the problems of public-sector management. It speeds paperwork and related functions, improves information flow and helps free managers for more creative analyses and decision making," Woodbridge said.

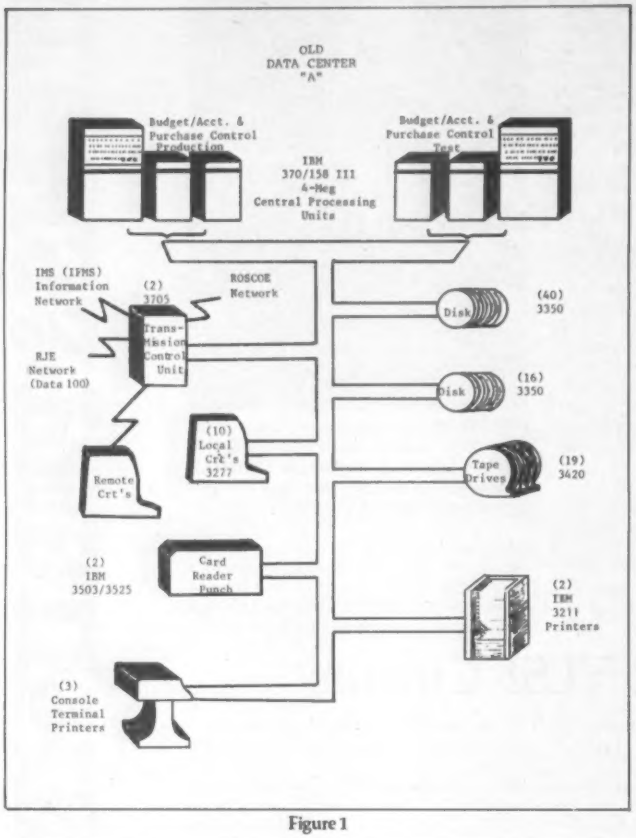

Figure 1

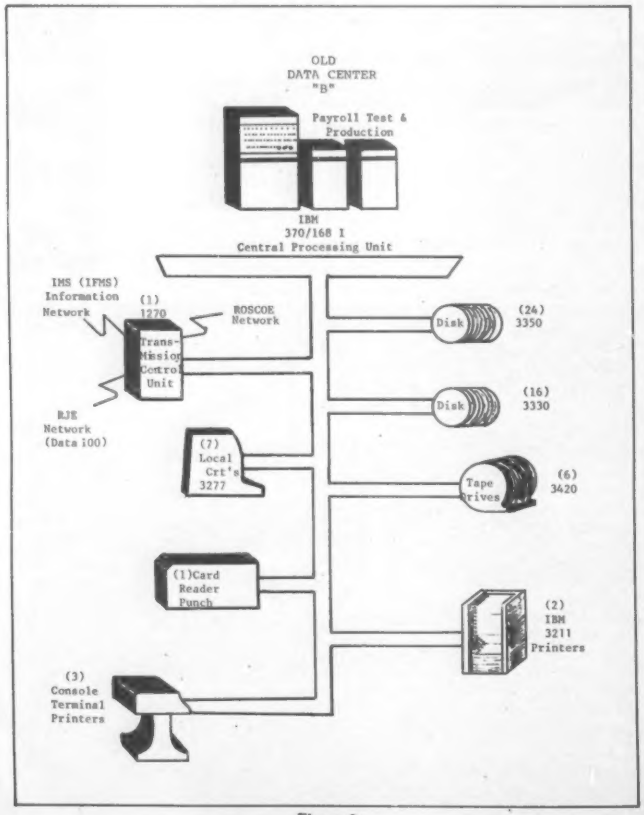

Figure 2

Multiagency 'Corporation'

IFMS supports the operations of the largest operating single government entity in the U.S. after the U.S. federal government. New York City's annual operating and capital budgets run to about $14 billion; 240,000 people are employed.

If the city were a corporation, it would rank in the top 10 of the Fortune 500 list.

"In most multidivision, multisubsidiary corporations, each of those entities does its own budgeting and detailed accounting," Woodbridge noted. "Not so the city, a multiagency 'corporation' with what is now a single financial system for all budget and accounting functions."

IFMS processes over 170,000 transactions weekly, produces over a million documents yearly, operates at an efficiency level that sees 90% of all first-time inputs run through the system error-free, supports both on-line and batch-type remote job entry operations seven days a week, 24 hours a day. Everybody uses it, everybody relies on it and to move any part of it without impacting operations presented a formidable challenge.

The move — as it came to be known — had its beginnings at the very outset of IFMS development. At that point Woodbridge, then the mayor's IFMS task force director (he became Fisa acting director in March 1977, when Fisa was comprised of four employees and two computers, and he was ready in June with 100 people to start operations July 1) decided to utilize existing space rather than build a new data center.

That decision minimized critically short installation time and saved money, but Woodbridge knew it was going to be a temporary arrangement.

Consolidation Strategy

Fisa was handling budget and account applications on two 4M-byte IBM 370/158s at one data center (Figure 1) and running payroll on a 4M-byte 370/168-I at a second data center (Figure 2). Consolidation became essential, first because of the added efficiency it would make possible and second because Fisa had to vacate both data centers.

The consolidation had to be done without stopping operations and with transparency to some 1,200 system users.

Fisa's strategy in planning the conversion was to retain its ability to bring the old systems back up in the event of something going wrong during the moves. The step-over plans were executed in a series of carefully coordinated moves, using project management techniques.

Detailed schedule were prepared describing specific tasks — "Drain, flush system"; "Print remote queues ('A' system)"; "Switch 50K-byte line"; "Bring up IMS"; "Management meeting on move status" — identifying the individual, department or organization responsible for each task. Also specified were the days, nights and hours when each task was to be completed.

Pert-type charts helped monitor progress. The work was planned to meet the target completion date — Feb. 19, 1979 — a Monday, which took advantage of the long Washington's birthday weekend.

Making the Move

Starting in December, Fisa brought in a 370/168-III to the new data center and transferred the payroll work from the 168-I to the 168-III (Figure 3).

Prior to the move, a production environment had to be on hand, with peripherals, sufficient to support operations until a new environment was up and running. This ensured not just ongoing production, but fall-back to an existing production environment if necessary. Fisa had enough peripherals for the old machines, so there was enough to handle any problems that might have developed.

Telephone lines were bridged from what would become the consolidated data center to what had been the second data center — and back — to handle on-line terminal and remote job entry traffic. Most lines were cut over and in operation before the actual move, and most of the system's remote users didn't even know they had been switched from one network to another.

In late January of 1979, an IBM 3032 mainframe was brought in and shook down in preparation for receiving the production work for budgeting and accounting.

"We closed Friday evening, Feb. 16, with everything normal, and reopened Tuesday morning again with everything normal — though much of what happened in between was anything but normal," Woodbridge recalled. "Construction was still under way with carpenters, electricans and plumbers creating their own environmental pollution and adding to security problems.

"On balance, however, everything went off very well without any interruption of service. We were helped by IBM and New York Telephone, and everyone deserves credit for a job well done."

Today, the data center includes an 8M-byte IBM 3033 processor which replaced the Model 168-III, and the 6M-byte 3032 (Figure 3). They operate in a Direct-Access Shared Device (DASD) environment that includes 112 IBM 3350s and 16 IBM 3330 disk drives providing over 20G bytes on-line; 32 IBM 3432 tape drives; two IBM 3705 controllers handling the IFMS information network, based on IBM's Information Management System (IMS); a program development network; an RJE network; over 325 on-line remote terminals; 13 local IBM 3277 CRTs; and an on-line payroll information network still under development.

Also in use are two IBM 3800 printing subsystems and three IBM 3211 impact printers.

This, in brief, is the configuration

. . .Comes Up With System for Fiscal Credibility

that has provided New York City — for the first time — with a unified, integrated system that incorporates as subsystems the basic budget, accounting, purchasing and payroll functions of all city agencies. Previously, the city's fiscal data were fragmented among multiple systems housed in several separate DP facilities, and the "encumbrance" concept — which holds funds aside to pay for purchase commitments — could be used only on a limited basis for contracts.

Now, with all subsystems accessing the central IMS data base, there is no need to maintain separate versions of the budget or to generate separate sets of accounts. Each element of information is recorded just once in the data base. Duplication and waste are avoided.

Equally important, the exact number of employees of city payrolls can be, and is, determined at different points in time, as well as a figure for commitments and expenses to date. None of those key figures could be determined with any accuracy in the past.

A major IFMS goal was to make possible independent audits of the city's books and financial statements — something that could not be done previously and which helped lead to the earlier crisis. Comptroller Harrison Goldin wrote, in his annual report:

"For the first time in the city's history, my office was preparing to issue financial statements meeting standards sufficient to withstand the scrutiny of an audit by independent certified public accountants. This goal has now been met.

"That a consortium headed by . . . one of the nation's largest accounting firms has rendered an opinion on the city's financial statements is significant in many respects. It adds credibility . . . [and] demonstrates that the city has brought under control a major aspect of its financial affairs."

Software Modules

IFMS' architecture is based on five key software modules, beginning with Flow Control, which is at the heart of on-line transactions processing. This is a generalized transaction processor linked to each application program such as budget updates or payroll input.

Flow Control accepts screen images from IMS/Data Communications or card images. The input is automatically formed into complete portions of documents and "handed" to the appropriate application program.

In addition to this "traffic control" function, Flow Control interacts with batch application programs to ensure the number of documents in a batch and their dollar value agree with the data in the batch header; accepts error condition signals from application programs; produces error reports; backs out any data base updates from processing a document which is later rejected — complementing a similar function in IMS; and supports an on-line error-correction facility that can display a screen image or rejected document for correction.

The second key software feature is the Common Posting Module, which helps assure the data integrity so essential to an accounting system. All application programs generate accounting entries — debits and credits — and pass them to this module, which then applies the updates to the four data bases which are the city's "books": budgets, payroll, purchasing, accounting.

The updates are performed in much the same way an accountant updates manual ledgers. No other module can update accounting files, assuring greater control of this critical function.

Next are the Master Tables, maintained separately, with standard access routines any application program can utilize to verify codes on an input document and to derive critical information from data within that entry. All data entry systems utilize codes for conciseness. Fisa controls Master Tables updating on a strict centralized basis.

The final key function is Quality Control, which is thought of as two modules because quality is approached first by thorough editing of entry documents to help avoid errors and second in terms of early detection of those that do get through.

"Errors inevitably creep in, so the problem is really to detect them quickly, within 24 hours," Woodbridge said. "The supporting detail for error verification is in the debits and credits that update the data base. To develop an early-warning quality control system, we had to take advantage of the relationship between transactions and the accounting data in the summary data bases."

IFMS night-shift processing dedicates some time to a quality control cycle that analyzes the current day's transactions against the debits and credits in the prior night's data base summaries. Every day quality control reports are generated. When a problem is found, a thorough check is done to make sure that the sum of the full detail and summary data bases agree and that the difference between the balance at the beginning and end of the day is equal to the work processed.

The Controller's Office is automatically alerted and, depending on the severity of the problem, all processing may be stopped until the problem is solved.

"I'll be the first to admit that in the beginning we did not realize how important the quality control system could be," Woodbridge observed. "It has proved so valuable that I could not conceive of developing another large system without one."

Personnel Critical

IFMS is not all computers, since it relies heavily for its success on the professionals who comprise the agency. Fisa now includes 279 people who constitute not just people running ma-

(Continued on Page 60)

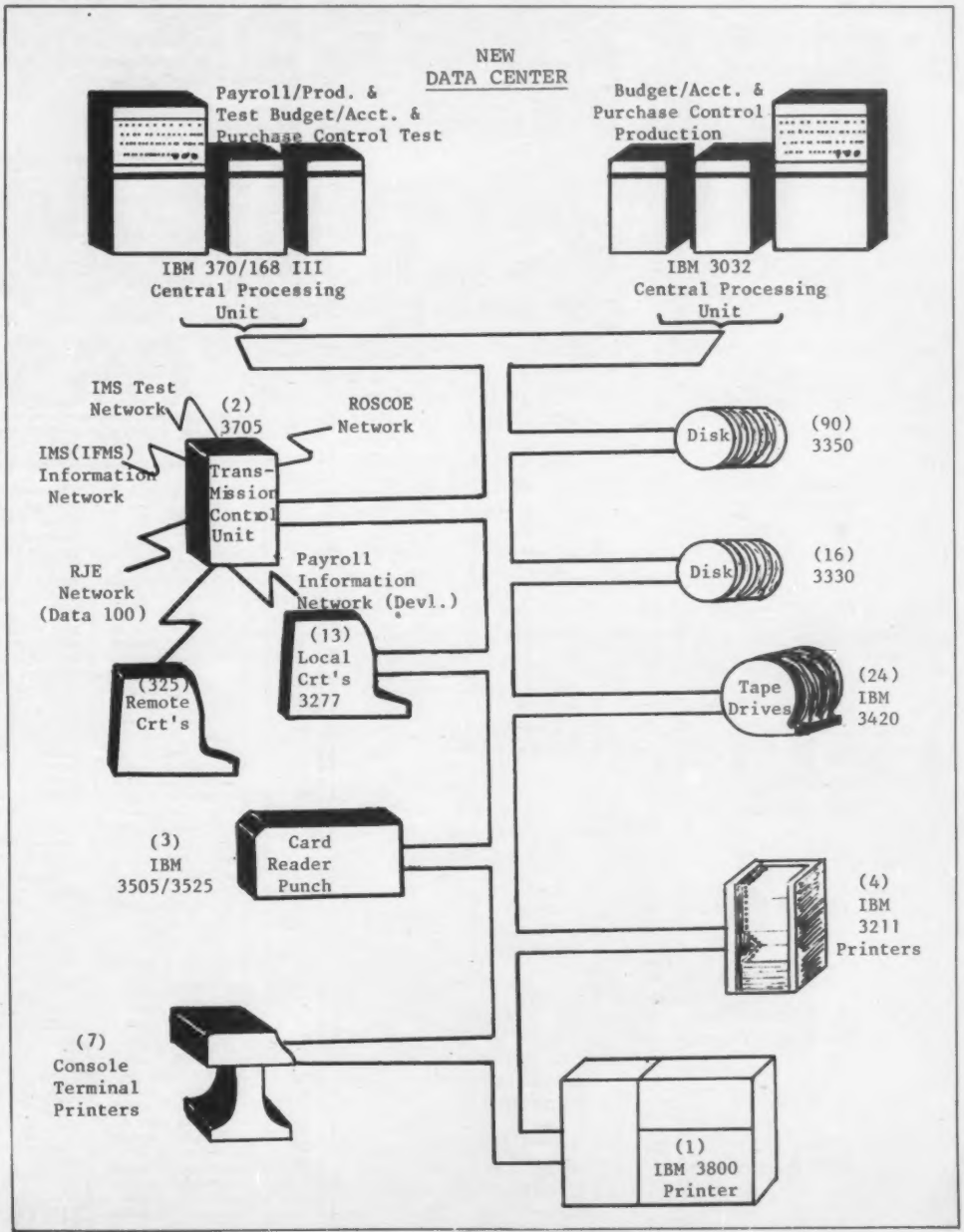

Figure 3

New York Gains Financial Management System

(Continued from Page 59)
chines, but a valuable resource to other city agencies.

Fisa professionals take an assertive role in working with other agencies. Ongoing efforts seek to improve input operations and refine outputs. Specialists in each of the major subsystems are available to work with their counterparts in the various city agencies to develop new responses to emerging needs.

A recent Fisa case study identified the types of errors most frequently made by each agency and led to cooperative efforts to minimize this problem. With an agency whose work load threatened to deluge the purchasing subsystem because of a huge volume of back payment vouchers, the Fisa staff worked out an agreement to handle a maximum number daily with the remainder processed weekends.

Fisa worked closely with the Office of Management and Budget to change budget modification procedures so they require fewer steps and less paperwork and improved the handling of mass charges, such as cost-of-living adjustments and budgets.

As a conduit of information, which it receives from all agencies and sends back to them in the form of reports, Fisa is now conducting an agency-by-agency study to provide tailored report packages to each according to its needs and seeking recommendations for new reports.

GENERAL NETWORK INFORMATION

OLD DATA CENTER
"A"

(CHART I)

Budget/Accounting & Purchase Control
Production & Test

ROSCOE Network:	5 Lines
	2 Locations
	48 Terminals
RJE Network:	7 RJE Stations
	4 Locations
IMS (IFMS) Information Network:	11 Lines
	61 Locations
	342 Terminals

OLD DATA CENTER
"B"

(CHART II)

Payroll Production & Test

ROSCOE Network:	2 Lines
	2 Locations
	12 Terminals
RJE Network:	3 RJE Stations
	2 Locations
Payroll Information Network (Dev.):	2 Lines
	2 Locations
	5 Terminals

NEW DATA CENTER
(CHART III)

ROSCOE Network:	5 Lines
	5 Locations
	52 Terminals
IFMS Information Network:	12 Lines
	65 Locations
	360 Terminals
IMS Test Network:	4 Lines
	4 Locations
	29 Terminals
Payroll Information Network (Dev.):	2 Lines
	2 Locations
	7 Terminals
RJE Network:	11 RJE Stations
	7 Locations

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by Kenneth L. Bowles

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NCR's SCHULTE:
It's the element that makes the remote connections, so that every terminal has access to every bank on the network. All across the state of Iowa.

DOOLEY:
Our first reason for going to NCR is monetary. With NCR, our costs are substantially lower than under our previous arrangement.

Dale A. Dooley (left) is executive director of Iowa Transfer System, Inc., in Des Moines. Jim Schulte is NCR district manager.

NCR's SCHULTE:
And at least a bit lower than the other alternatives you explored.

DOOLEY:
Then there is the support we received from NCR and from you, Jim. And NCR's known commitment to EFT.

NCR's SCHULTE:
NCR representatives are specialized. All the people in my group work exclusively with financial institutions. So we are in tune with current financial trends. Other NCR representatives have parallel specialties so they can be more responsive to the problems peculiar to their industries. It's a concept that is working well for us.

DOOLEY:
The third reason is software. Only NCR could provide the switch software we needed when we had to have it.

NCR's SCHULTE:
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DOOLEY:
Finally, our decision was influenced by the dependable performance of the other NCR systems within the network. And we have had the same experience with this system. Our uptime level has been very high — a critical consideration when you're talking about a network switch.

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On-Line User Sells 18% More Machine Parts

CHICAGO — "It's hard to measure, but I think we have increased parts sales because of our new on-line parts ordering system," Vice-President and Assistant General Manager Alvin E. York said here at the Central Parts Division of Clark Equipment Co. "Our total corporate sales were up 18% for the first six months of1979, and parts sales were up substantially more.

"Customers have always been able to get a 'Brand X' part right away, down the street. But now that we ship so quickly, they can get Clark parts just as fast — and they're doing it," York said.

Customer downtime costs are astronomical when heavy construction equipment, for example, is involved. Clark's goal is to ship all of the service parts for machines in warranty — and 98% of the parts for machines out of warranty — within 24 hours after the Clark dealer phones in an emergency order.

However, this goal is usually surpassed: the on-line system, running on an IBM 370/158 at the Chicago depot, makes same-day shipment possible in most cases, often, within just two to six hours. Despite the weight of the parts, a good percentage go via air transportation.

Order Processing

As orders arrive at Clark's warehouses in Chicago, Atlanta and LaPorte, Ind., inside salespeople enter them into the system via IBM 3278 CRT terminals. This entry automatically subtracts each part ordered from the 160,000-item inventory and immediately prints and punches picking cards and shipping papers in the warehouse.

Receiving is also on-line, and feeds inventory updating and back-order processing.

Often the system produces invoices on the same day merchandise is shipped, which is at least a day faster than in the past. This prompt invoicing speeds the cash flow.

Further, on export shipments the system prints invoices for priority orders on-line because the paper-work must be in hand to move the material.

Automatic purchase ordering when inventory reaches preset levels is another feature. Purchase orders from the computer go right into envelopes unless they exceed a certain dollar amount or number of pieces, in which case they are flagged by the system and reviewed before mailing.

Group Ties

All of the sales groups in the company are tied into the on-line system via some 40 IBM 3278 CRT terminals for order entry.

Terminals and 3776 printers are also located in the Chicago, Atlanta and LaPorte, Ind., depots, where they are used for inquiry into accounting, material control housing, pricing, product availability and inventory movement.

All told, Clark has some 75 CRT terminals tied to the 370.

Also linked to it via typewriter-like terminals are some 250 of Clark's dealers in the industrial truck and construction machinery divisions. These terminals communicate with an IBM System/7 at Clark's Buchanan, Mich., headquarters. The System/7 acts as a message switcher, feeding inquiries, orders for new equipment and for routine parts shipments to the IBM/370 at the Chicago depot. The communications turnaround on this network is 30 minutes or less.

Clark also has expediters who supplement the on-line system and handle only emergency shipments for Clark dealers, OEMs and export. It is the responsibility of these expediters to find a needed part. If this requires a worldwide search, a worldwide search results.

Delays Eliminated

"Our batch system of the past was pretty good," DP Manager Tom Krucker said. "But on-line has eliminated the delays of an hour here and an hour there typical in the batch mode.

"And we've also eliminated the sudden flood of orders to the warehouse from the old system," Krucker said. "Same-day shipment was more difficult then, especially later in the day. Realistically, noon was the cut-off, although with a lot of expediting some orders that came in as late as 2:30 p.m. were shipped the same day. Now each order is printed in the warehouse as soon as it is entered at a terminal, and 7 p.m. is the cutoff.

"Also, with the batch system, marketing personnel had to spend excessive time out in the warehouse expediting hot orders," Krucker explained. "On occasion, an inside salesperson would tell a dealer the part was in stock, the order would be processed and only then would an out-of-stock condition be discovered. This was bad for dealer and customer relations, of course.

"With the on-line approach, when the inside salesperson takes the phone order from the dealer, he displays the inventory status of the item needed and can tell the caller immediately if it's in stock in Chicago or possibly Atlanta and from which warehouse it will be shipped."

Dataproducts Announces 180 Char./Sec Matrix Unit

WOODLAND HILLS, Calif. — A 180 char./sec dot-matrix impact printer with a seven-wire head has been introduced by Dataproducts Corp.

Offering the same operating characteristics as its "big brother" the M-200 printer, Dataproducts' M-120 is said to differ only in its slower speed and lower price.

The M-120 uses a 7 by 7 half-dot matrix font in standard or expanded characters and operates in a bidirectional, logic-seeking mode, according to a spokesman.

Work throughput ranges from 75 line/min for a full 132-char. line to 200 line/min with a 40-char. line. The average throughput is 120 line/-min.

With a minimum paper slow speed of 10 in./sec, the M-120 features a maximum data transfer rate of 500K byte/sec, the spokesman said. The standard interface is an 8-bit parallel; alternately, users can choose the optional RS-232C serial interface or Centronics Data Computer Corp. compatible unit.

The tabletop M-120 features a 128-char. Ascii set and a print head that reportedly is good for more than 200 million characters.

The single-unit OEM price for the M-120 is $2,150, compared with $2,495 for the 340-char./sec M-200.

Dataproducts is located at 6200 Canoga Ave., Woodland Hills, Calif. 91365.

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Handles 20 Million Inquiries

Stamp Firm Upgrading to Lick 50%/Year Growth

By Marguerite Zientara
CW Staff

CHEYENNE, Wyo. — A philatelic company here — reputedly the world's oldest and largest — is converting from an IBM System/3 to a Burroughs Corp. B1885 to handle its 50% annual growth in sales.

The president of Unicover Corp., a firm that deals in first day covers for stamp collectors, founded his own business in 1963, while still in high school, by advertising in various philatelic periodicals.

In 1968 he helped found Unicover Corp., which in turn acquired the well-known Fleetwood Co., founded in 1929. President James A. Helzer's business now exceeds $14 million annually, employs nearly 200 people and receives nearly 20 million pieces of mail a year.

Using the trade name Fleetwood, the corporation deals with more than 200,000 first day covers for collectors around the world, Helzer said. First day covers are custom-printed envelopes with artistic designs and commemorative stamps, honoring an important event, that are cancelled on the day of issue by one post office.

Timeliness an Asset

With growth of more than 50% per year since 1968, "we've prospered because we can make timely management decisions with the help of various management reports generated by computer," Helzer said.

Previously relying on an IBM System/3 Model 15D with 385K bytes of memory, Unicover recently ordered Burroughs' B1885 dual-processor system with 1M byte of memory, 22 TD-830 CRT units and two 1,100 line/min printers.

"The 15D is the top of the line for this series of IBM computers," corporate vice-president Marvin Coughenour noted. "We have a fully loaded system that we can't put anything more on, and we just need more computer power."

After an "extensive review" of equipment from Burroughs, Univac, Honeywell, Inc., NCR Corp. and other divisions of IBM, "the Burroughs machine appeared to be the best choice in terms of technology, software support, price and ease of conversion from the existing system," Coughenour noted.

Unicover is "three or four months" into its conversion process and doesn't expect the new machine for another year. The firm will add one major new application to the Burroughs system — financial reporting and inventory control — and expects to have about six more within one year of installation, Coughenour said.

The financial reporting and inventory control applications will include such tasks as general ledger, accounts payable and receivable, personnel, management reports, production scheduling and order picking and mailing.

Burroughs program products that will be used with the B1885 include Data Management System II, DM Inquiry, Production Control System III modules and Report Program Generator.

Also used will be Transaction Control System II, which includes Master Control Program II, Network Definition Language, Generalized Message Control System and On-Line Data Entry System, among others, Coughenour said.

The corporation has also developed specialized programs in the areas of subscriber services, order fulfillment and advertising response statistics to analyze advertising that appears in such publications as *National Geographic* and *The New York Times*.

"Our success is a result of a continuing program of more and better services for our customers across the nation and around the world," Helzer said.

Insurance Firm Speeds Audit Response Times

PARSIPPANY, N.J. — Bankers National Life Insurance Co. is achieving five times faster response times for new business audits under Life 70 after replacing its IBM 370/135 with a Magnuson M80/4.

"That's the most dramatic increase in processing power we've seen with the M80," according to William Albrecht, vice-president of the Information Systems Division. "With the 135 under CICS, we had 25- to 30-second response time; with the M80, we are achieving, 5- to 7-second response time."

According to Albrecht, Bankers was the first to process the new business portion of the Life 70 software package. Life 70 is a software package supplied by TCC of Austin, Texas, and consists of a new business immediate update system called Trac, a daily cycle system and numerous other life insurance processing systems.

The company's daily cycle includes new business, payments and billings, internal contractual changes and external changes such as address changes and mode premium changes.

Bankers converted to Magnuson's M80/4 with 2M bytes of memory in June 1979 from a 370/135 with 512K bytes of memory. It had been an IBM shop since 1972 when it replaced its RCA Corp. hardware.

Confronted with an immediate need for more power and capacity to handle the 90,000 insurance policies as well as check splitting for mutual funds and flexible premium annuities, Bankers considered everything from IBM's 3031 to the 4341 and 4331 as well as Itel Corp. and Magnuson machines.

Albrecht, who has been through several conversions, was also looking to avoid costly and aggravating machine chargeouts. "We've always looked for a way to grow with the same machine, which is a principal reason we selected Magnuson." In 1970, he said, Bankers converted from IBM to another manufacturer, but the software conversion was "traumatic."

"When Bankers converted from IBM to Magnuson, the software that ran on the 370/135 ran on the M80 without modification and we have had no hardware compatibility problems whatsoever."

Machine performance and compatibility weren't the only criteria for selecting Magnuson, according to Albrecht. "We were impressed with the people," he said, "and we had contacts in the financial community who were positive about the company."

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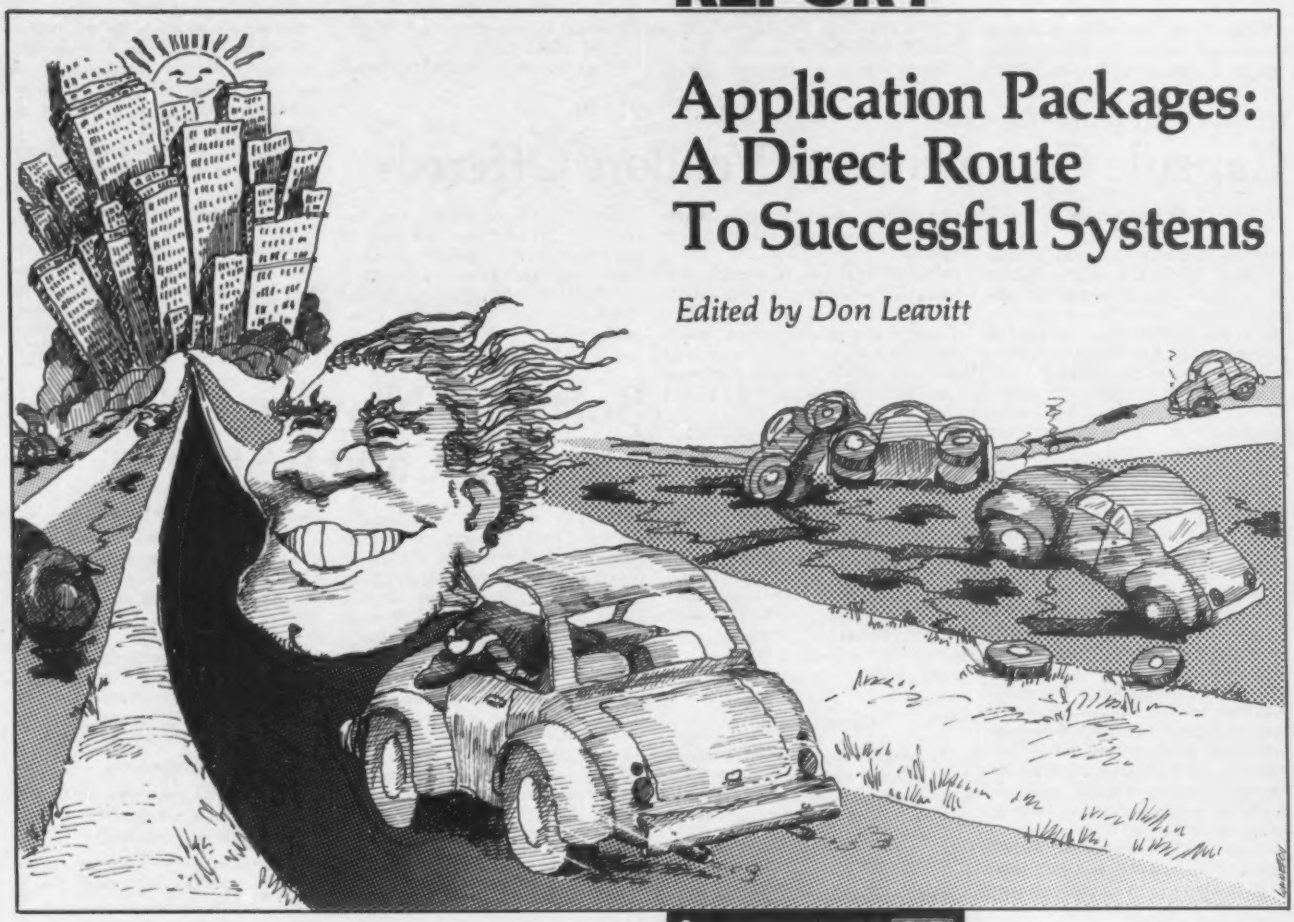

Application Packages: A Direct Route To Successful Systems

Edited by Don Leavitt

COMPUTERWORLD

Problems Automatically Rerouted

Custom Package Eases Time, Inc.'s Data Entry

CHICAGO — Many organizations have enhanced the equipment side of their data entry operations, but a major publisher here has gone further by extending the logical capabilities of the whole operation.

In its system, Time, Inc. has shown that on-line data entry can be made extremely productive by automatically intercepting problem transactions and routing them to special problem-handling terminals.

The system is an augmented version of IBM's CICS developed by SEI Computer Services but tuned to the specific application by a joint Time/-SEI effort.

Time started out with a classical second-generation card/tape/print system for its Book Division, which ships 1.25 million items a month from a selection of several hundred products. Each product line or book series had its own files and was processed separately. A person subscribing to multiple series appeared on the files for each series.

Working together, the DP staff at Time and the consultants from SEI created a unified, on-line, subscriber-oriented system which now includes more than six billion bytes of information about 30 million past and present subscribers. This system — called BRGE — includes order entry, follow-up shipping, inventory control and inventory and sales forecasting.

Under BRGE, all updating, including financial information, occurs on-line.

The data base is organized around SEI's Cylinder Logic Access Method (Seiclam), which provides both direct and sequential access at the EXCP level. The subject of a presentation at the 1976 National Computer Conference, Seiclam has extremely fast and flexible Vsam-like capabilities along with many other features.

Problem Rerouting

One of the significant features of BRGE is its ability to intercept and reroute problem transactions to special terminals. Routine, programmed error-detection logic distinguishes between the types of errors that can be handled by the data entry operator and those that require supervisory or specialized intervention.

If the error can be handled by the operator, the transaction is returned to him with appropriate diagnostic information. If not, the transaction appears to the operator as having been successfully completed — so that the operator can go on with the next transaction — but is actually enqueued for special handling by a supervisor or specialist.

City/Zip Code clashes are examples of transactions that would be sent to a specialist, who calls them up one by one for handling and completion.

The system also allows data entry operators to request rerouting of a transaction that *appears* to be a problem — even if the programmed logic didn't "catch" it — for special handling.

Bad input may not be the only problem for the system. Program interrupts during transaction processing cause rerouting of the transaction to a *programmer* terminal for resolution of possible program bugs.

In addition, when a specialist calls up a transaction, it is reexecuted and the results presented to the specialist. In many cases, the condition causing the original error will have already changed — timing differences among multiple transactions have been resolved; a program bug has been fixed — and the error does not recur. In that case, the transaction completes nor-

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In Five Application Areas

Capsule Comments on Vendors Offered

By Don Leavitt
CW Staff

Assuming it makes sense to consider packaged software instead of making an in-house development effort, how does a user get to know anything about the vendors? Especially when everything he's heard says the vendor is as important as the package?

One source of that information may be the capsule comments on vendors contained in International Data Corp.'s (IDC) study on the independent packaged software market, published in March. The tables that liberally illustrate the report are useful too, for they show the ranking and market share — in dollars and percents — of the various vendors.

The report divides the application package market into five generic areas: accounting; payroll/personnel; manufacturing; banking and finance; and insurance company operations. The grouping helps highlight the dominance of specific vendors in special areas, a pattern that doesn't show up in the general table.

IDC counts both general accounting systems (accounts payable, accounts receivable, general ledger and fixed assets) and specialized systems with a problem-solving orientation (financial planning, forecasting and tax planning) in the accounting package market.

General accounting packages were among the first application products on the market, just as the applications themselves were, historically, among the earliest tasks to be attempted in business-oriented DP.

The logic of such systems requires a lot of memory and high-speed peripherals to accommodate the massive I/O processing inherent in accounting operations. The systems and the specialized routines are therefore designed usually for large-scale mainframes, predominantly IBM 360s and 370s.

Accounting Leader

By IDC's calculations, Management Science America, Inc. (MSA), with $10 million in revenue and 22% of the market, was far and away the leader in applications accounting in 1977.

Massachusetts-based Software International Corp. (SI) was second, with $5.5 million revenue and 12% of this particular market segment, the report showed.

MSA offers an integrated network of financial accounting systems built around its general ledger system. The company also markets Alltax, which the researchers pointed to as "one of the most widely recognized subroutines for tax accounting in the market today."

SI also offers a full range of accounting software, with a tendency to focus on manufacturing operations. Much of its user base is on mainframes, but SI is now strengthening its support of the small business computer user.

Payroll processing has always been a significant part of the typical business-oriented data center's work load. Payroll packages have been well received, especially when the vendor takes responsibility for keeping the programs current with federal and state regulations.

Payroll Leaders

The growth of personnel management systems has been aided by general recognition that much of the data needed was already contained in the payroll system.

New Jersey-based Information Science, Inc. (Insci), leads the pack of payroll/personnel system vendors (1977 revenues of $9 million, or 20% of the total), with MSA not far behind ($7 million, 16%) and General Computer Services, Inc. (GCS) a badly

(Continued on SR/4)

Software Newcomer Gets Off to a Capital Start

BOSTON — Despite a questionable economy, limited interest on the part of institutional investors, a maze of government regulations and strong competition for available capital, Carleton Corp., a software development and marketing firm, was successfully started here last year.

There wouldn't have been a start-up if it hadn't been for a substantial commitment on the part of a group of private investors. The fact that they made the commitment has implications for the vast community of DP users and the software industry in general as well as for Carleton in particular, according to Robert C. Wilbur, the company's president and founder.

The present software market is dominated by companies born in the late 1960s, and the products offered by these companies are based on technologies of 10 years ago, Wilbur argued. By contrast, today's technology "makes possible an entirely new generation" of software, and the opportunity now exists for new companies to design and deliver innovative software based on that technology, he added.

Ties to Hardware

Wilbur is also concerned about the dominant role in the software market

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Annual Sales of Packages Seen Growing at 29%

By Don Leavitt
CW Staff

Carved into the front of the National Archives building in Washington, D.C., a motto sums up the legendary American optimism for the future of the nation. It also sums up, inadvertently, the optimism many feel for the future of the software industry.

The inscription reads "The past is prelude," and that means, as one father was overhead explaining to his son, "You ain't seen nothing yet!"

Last spring International Data Corp. (IDC), the Massachusetts-based market research firm, put dollar dimensions on the present state of the software industry and where that industry will be in 1983. The numbers seem to confirm the positive vibrations felt by many vendors and current users and should push nonusers into rethinking their positions.

In late 1969 and early 1970, IBM unbundled much of its software. At that time some packages and more custom work were already being offered.

From a start of somewhere above zero then, the market generated revenues of $500 million during 1977. Packaged software offered by the independent suppliers will exceed the $2 billion mark by 1983, according to IDC.

The basic arguments for packaged software — economy of time, resources and money — have been accepted by many sites. Beyond that, the continually expanding base of package users "has established credibility for individual packages and wider acceptance of packaged software in general," the report said.

Horror stories of package capability-vendor support-user need mismatches, once the bulk of user experience, are now the exception. Counts of users reach into the hundreds for the more popular packages, into the thousands for the most widespread ones.

Good Growth in Applications

While the entire software market is expected to grow approximately 29% annually, compounded through 1983, IDC said application software — as distinct from the systems and utility segments — will show the greatest growth. Accounting for 47% of software revenues in 1977, application packages will contribute close to 55% of the much larger 1983 revenues, the researchers estimated.

Before examining each of the three general segments in detail, however, IDC warned there are several factors that could limit market growth. Too many installations still do not realize that they have alternatives beyond in-house development, on the one hand, and software from hardware vendors, on the other.

The hardware vendors are in fact conscious of the independent software vendors and now realize the need to provide good software. Various observers have credited IBM with movement in this direction (in some cases). IDC cited NCR Corp. and Wang Laboratories, Inc. for "aggressively" developing and marketing application software.

Biggest Problem

Finally, the researchers pointed to the one problem that impacts every effort to build good software, whether at a vendor facility or a user site: people with the talent to design, write and implement software.

This "key resource" is just plain missing, IDC said, and suppliers are considering both package and company acquisitions to expand their product offerings.

Focusing specifically on application packages, the authors noted that such software is geared to the particular needs of a given industry and/or function. They cited the needs of general accounting, payroll/personnel, manufacturing, banking and finance and insurance as examples.

IDC also pointed out that, although application systems make up the bulk of the market, application routines — handling special parts of total systems — are also part of the scene.

More so than systems or utility packages, application software is marked by flexibility. IDC observed that the package must contain a high degree of modularity for optimum adaptability in order to avoid being too general or too specific for a given user's operation.

"The user is not likely to change his operation radically to suit the program," the researchers added.

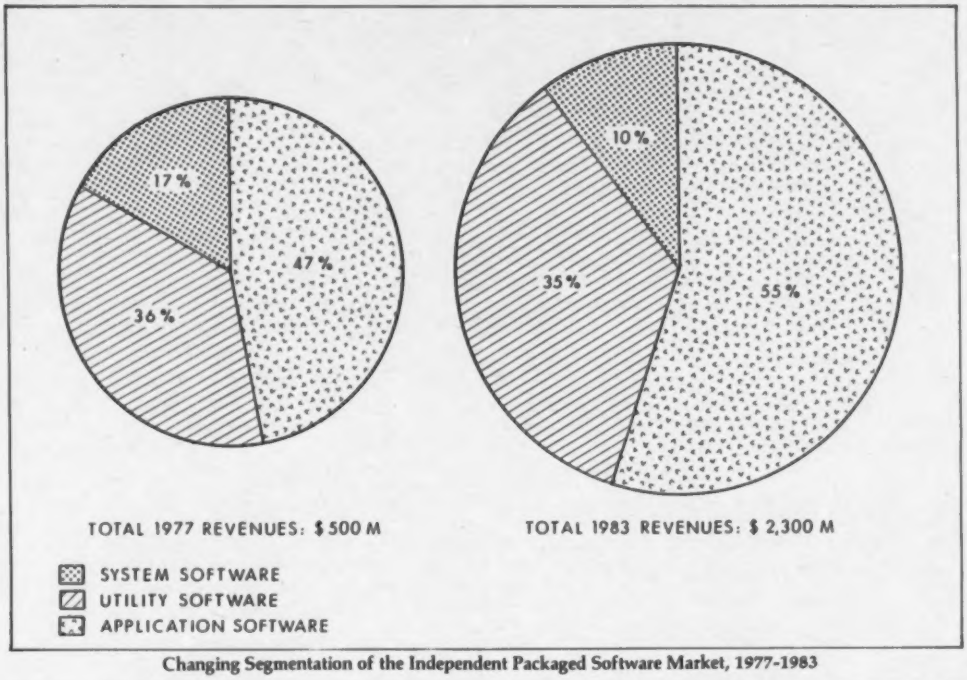
Need for Flexibility

Later, the report showed just how segmented software can be to meet that need for flexibility. In describing one particular system, IDC said there are "600 to 700 modules comprising the seven major packages in this system with an extended data base and on-line options."

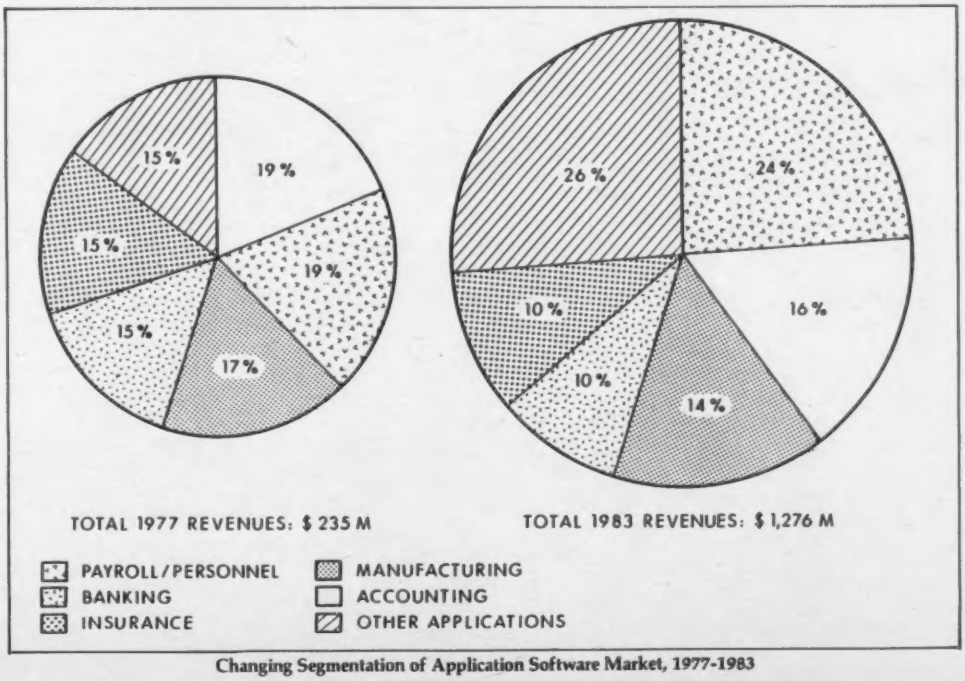
Because many users of applications packages are untrained in DP concepts and need "detailed documentation, simple-to-use techniques and meticulous error-checking," development costs will be high.

On the other hand, the end product can often be used across hardware lines — thanks to Cobol or, more rarely, other standardized languages. This versatility allows application packages to have a broader marketplace than systems and utility software.

(Continued on SR/14)



Changing Segmentation of the Independent Packaged Software Market, 1977-1983



Changing Segmentation of Application Software Market, 1977-1983

Report Offers Capsule Comments on Vendors

(Continued from SR/2)

trailing third ($2 million revenue and 4% of the total market).

Insci's Human Resources System is made up of eight separate packages. Originally developed for the IBM market, four of the basic components have been adapted to run on mainframes manufactured by Burroughs Corp., Honeywell, Inc. and Univac. Insci's software is also available on a service bureau basis.

IDC noted that GCS started as a custom software development and consulting firm for the banking industry. In addition to a payroll/personnel system, the company offers a Personal Trust Accounting package (which IDC mistakenly called a "personnel trust accounting system").

The company does not plan much development for either non-IBM mainframes or minis in the near future, the report said.

Manufacturing Practices

The market for manufacturing application software is experiencing "tremendous" growth, IDC continued. A total manufacturing system consists of individual modules that perform specific functions, such as bill of material maintenance, purchasing and inventory control, production routing, product cost estimation, production scheduling, material requirements planning (MRP) and capacity requirements planning.

MRP is the "hot topic" because it produces highly visible results quickly. Another functional area that will provide growth potential for independent software vendors is shop floor control, IDC said.

Such control is the "next step" beyond MRP and is the key to controlling work-in-process inventory and assuring work orders are completed by the due date assigned by the MRP system.

'The market for manufacturing application software is experiencing "tremendous" growth . . . A total manufacturing system consists of individual modules that perform specific functions, such as bill of material maintenance, purchasing and inventory control, production routing, product cost estimation, production scheduling, material requirements planning (MRP) and capacity requirements planning.'

As in most other software markets, the trend toward on-line, interactive processing will change the manufacturing application segment, the report said.

According to IDC's tally, the manufacturing application software marketplace has one vendor with a significant share of the total revenues and another four vendors whose sum total approaches that of the first. But a heavy majority (61%) of all revenues for manufacturing software is scattered among all other vendors.

With an estimated $8.5 million revenue or 21% of the 1977 total, Martin Marietta Data Systems (MMDS) is at the top of the heap. Two versions of its Modular Application Systems (MAS-80) exist, one with a batch orientation, the other working with transactions against a data base management system.

MMDS also has financial and accounting modules that can be integrated with the manufacturing subsystems.

ASK Computer Services, Inc., from California, and SI tie for second place in manufacturing applications.

ASK was one of the first software vendors to develop manufacturing software for minicomputers in the early 1970s. Currently its Manufacturing Management (Manman) software — and a companion Financial Management (Finman) system — are based on Hewlett-Packard Co. HP 1000 and HP 3000 hardware.

SI (originally known as Manufacturing Management Systems, Inc.) offers a highly modular MRP package for the IBM 360 and 370 markets, IDC noted.

Banking Software

While manufacturing software includes a variety of subsystems, all of which, ideally, are integrated, the marketplace for banking software is a fragmented one, with numerous areas of specialization, the report said.

IDC noted that independent vendors are offering systems for trust, demand deposit, credit, credit card and loan accounting, as well as general financial and portfolio management systems.

Specialized applications packages that exist in the finance industry are more often available from firms in this industry than from companies specializing in software development, IDC said.

University Computing Co. (UCC) in Dallas is ranked first among the providers of banking/finance software. The consolidation of UCC's Banking Division into the company's Commercial Division (somewhat more than a year ago) provided a "stronger, more effective" software products organization, the study commented.

Unlike most vendors in the applications area, Florida Software Services, Inc. simultaneously developed its products for IBM, Burroughs and Univac mainframes. The company has also moved into the minicomputer user area. In 1977, Florida Software Services was ranked second in banking software, with $4 million revenue and 11% of the market.

New Jersey-based Arthur S. Kranzley & Co., with its Charge Card Accounting System and support for electronic funds transfer, is in third place ($2.5 million, 7% of market); 68% of the banking area is served by "others."

Software for insurance company operations also covers a spectrum of tasks — not even directly related to one another — in two distinctly different lines of business — life and health, and property and casualty protection.

The degree of specialization probably accounts for the bulk of this market being offered by five vendors with only 28% of it going to "others."

Insurance Systems of America, Inc., from Atlanta, provides both life and property/casualty packages. Originally underwritten by a group of insurance companies, it had 20% of the specialized software market and $7 million in revenues, leading its category in 1977.

The Equimatics Division of Informatics, Inc., with packages for life insurance work, and Policy Management Systems, with property/casualty packages, each had $6 million revenues and a 17% share of the submarket that year, IDC reported. Revenues from Equimatics' insurance-related products increased 47% in 1977 over those in 1976.

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Software Newcomer Gets Off to a Capital Start

(Continued from SR/2)

played by IBM and other computer manufacturers. They are first and foremost producers of hardware systems, and they develop software to be compatible with — "and primarily to sell" — their own equipment, he said.

Without the ties to hardware, new software companies have a greater vested interest in genuine innovation and technological advancement. Because they are small, newcomers — like Carleton — don't have the management overhead — "call it 'bureaucracy': that's what it is" — of the established software firms.

Firms like his can operate more freely in an entrepreneurial style, and that enables them to develop and deliver a more efficient and sophisticated product, Wilbur claimed. "The emphasis on software in the '80s will be on saving time for the user, instead of saving time for the machine at the user's expense."

Start-Up Strategy

The strategy for Carleton's successful start was carefully constructed. Wilbur, a Certified Public Accountant with an M.A. from the Wharton School of Business, assumed responsibility for marketing, sales, finance and administration. William L. Steele, then director of development for a major software system company, joined the founding team to head the development, documentation, training and installation areas.

Steele brought seven years of software development experience to Carleton. Wilbur's background included three years with Price Waterhouse & Co. in auditing, and three years with a successful accounting software vendor in sales and marketing. The founders were confident their skills and backgrounds were diverse enough to cover all areas without hiring additional management in the company's initial phase.

Dreamers with a good streak of common sense, they wanted their first product to be a significant contribution to the marketplace. It would have to be technologically feasible and useful to a rapidly growing base of installations. More than that, it should meet deficiencies found in all other comparable products already on the market, they felt.

With that premise and the founders' backgrounds, they targeted on a retrieval, analysis and reporting system for both internal and external auditors. The design combined the best elements of existing products, but included, they hoped, significant capabilities which were lacking in the competition. The product design uses modern programming techniques and can run on both IBM and other systems.

Raising Capital

Once they knew where they were heading, the founders recruited an initial backer with extensive experience in raising venture capital. Wilfred E. Gardner, Jr., a corporate lawyer, joined the founding group. Gardner's understanding of the structure and climate of the venture capital community was one of the key ingredients of the successful formula.

The next major step was to document the start-up with a clear and concise business plan. The product design was documented. The market research that had been conducted was analyzed and condensed. Detailed pro forma cash flow projections were calculated according to "best case" and "worst case" assumptions. The amount of capital necessary for the start-up was pegged at the total that would be required in the worst case situation.

"Once the business plan was completed," Wilbur said, "the founding team had the sales tool necessary to attract sophisticated investors." A second document was prepared to describe the terms of Carleton's offering.

Wilbur, armed with these documents, launched an intensive five-month search for the capital. "The goal was clear," said Wilbur. "Inadequate capital is the single most important reason for the failure of business start-ups."

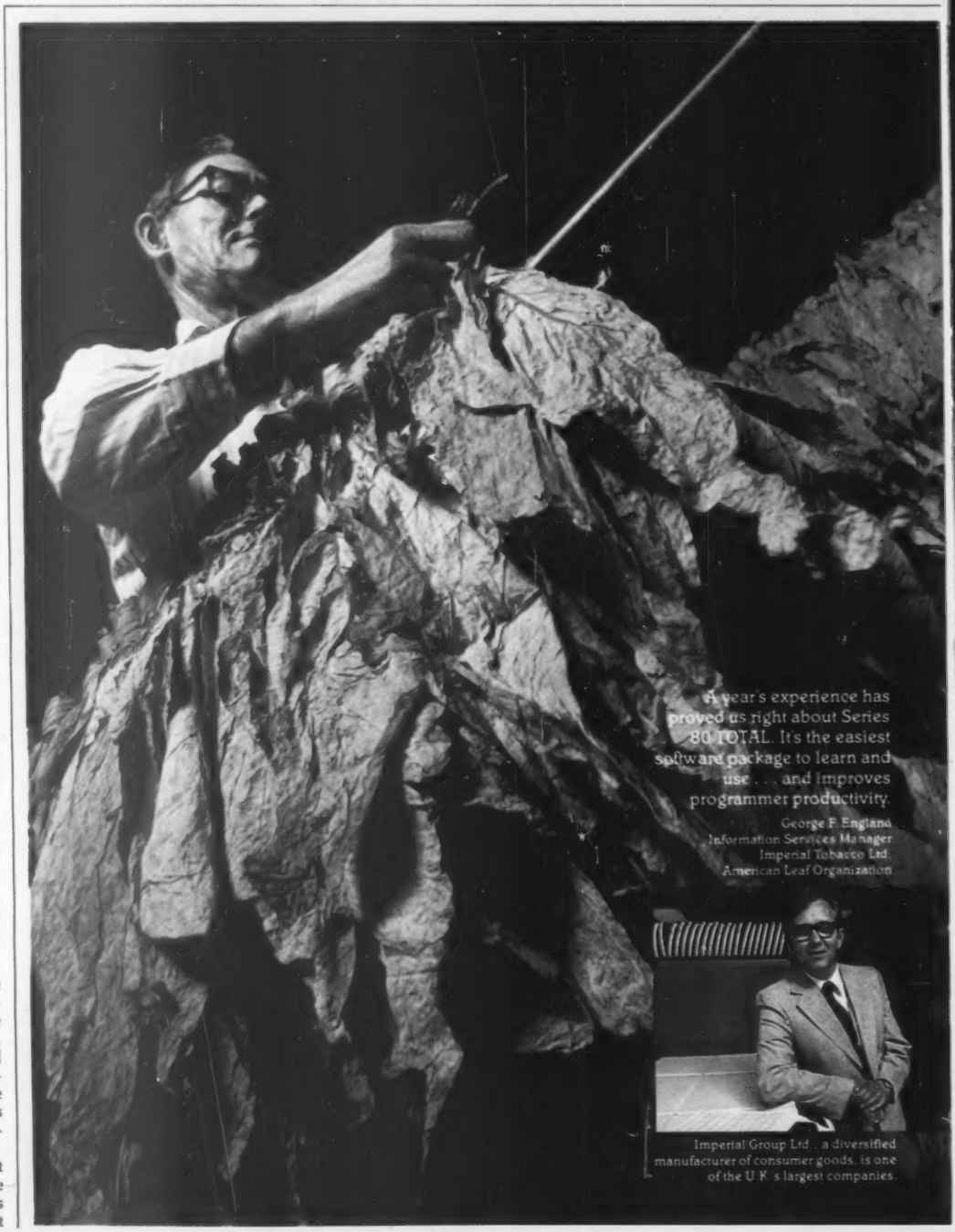
"Both persistence and flexibility are required of founders when launching an entrepreneurial venture," Wilbur added. After several months, he had raised a substantial amount from individuals and private investors, but it became evident that the founding group would not reach the established goal without professional help.

At this point, the firm of Foster, Dykema, Cabot and FDC was invited to assist Carleton. After conducting its own exhaustive research on the venture, its principals and their products, FDC agreed to invest in Carleton and to raise some additional capital.

According to a spokesman for FDC, "When we were introduced to Wilbur and Steele, we were impressed with the plan ... As a general proposition, when you evaluate a venture, you study all the information — the market, the product, the financial projections.

"If all is sound, then you end up by making a judgment about the people ... Wilbur looks like a winner," the FDC spokesman said, with the help of FDC, Carleton completed raising the required capital.

Carleton Corp. is completely staffed and in full operation today, less than a year after the idea was conceived. Wilbur and Steele hope that their experience will serve as a model for potential entrepreneurs in the software industry. They believe that the industry may soon witness the emergence of a new wave of software companies.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Dozens of Applications

Package Assists Flock of Poultry Science Users

ATHENS, Ga. — It might not be the philosopher's stone, but the Statistical Analysis System (SAS) software from SAS Institute, Inc. is something of a common denominator at the University of Georgia's Poultry Science Department. The package is used by practically everyone, from secretaries to research students and professors.

But it wasn't always that way. Joshua Sharlin, a Ph.D. candidate in poultry physiology, remembers a different picture. When he joined the department some two years ago, SAS was utilized by a few faculty members and graduate students. However, no orchestrated attempt was being made to introduce others to the potentials of the package.

Today a wide interest in SAS has been stimulated, much of which stems from the enthusiastic recommendations of Sharlin, a SAS convert since he worked as a consulting statistician at the U.S. Department of Agriculture research farm at Beltsville, Md.

"I have introduced people to the system," he said, "and the people I've interested have interested others and on down the line till now we are in the third or fourth generation of users.

"And these users exhibit a great deal of competency. I know when I first started helping people use SAS, I used to get a great many questions. Today, I don't get that many, which indicates to me that the users are comfortable working with the package."

The variety of SAS users at Poultry Science is equaled only by the variety of applications for which the software is used. Sharlin, who has only taken one computer science course in his career, has routinely used SAS for experimental work for five years.

Recently, in an attempt to show what SAS can do with pedigree data, he used its data manipulation capabilities to generate a variety of reports from a studbook of Persian Leopards. A studbook is a list of animals that are or have been in captivity. It shows birth and death dates, dam and sire identification and current location.

From this raw data, SAS was used to calculate seasonal distribution of births and deaths, average litter size, age of first reproduction and age distribution of the living population year by year for the last 10 years. A total of 13 different reports was programmed in less than one week.

According to Sharlin, the name Statistical Analysis System does not fully describe the package. "I know many users who use SAS mostly for data manipulation and report generation and rarely execute any statistical procedures. In my opinion, SAS is unique in that it allows sophisticated computer use by people without a computer background."

Work in Genetics

Another Poultry Science user, Dr. Kenneth Washburn, utilizes SAS extensively for experimental work in genetics. Various research projects such as studies of the effects of alfatoxin on blood parameters and exploration of genetic variation in such characteristics as carcass fat produce large quantities of data for computer analysis by SAS. Washburn and his assistants often conduct as many as five to six experiments simultaneously.

Without the package, the calculations would be done manually. Manual computation, according to Washburn, would limit experimental design. "We would have to use smaller numbers of birds in our experiments, and that would affect the validity of our results.

"SAS offers us the greatest efficiency possible today in looking at data. It is a first-rate organizer. I would say some 90% of all the experimental work I do involves the computer," Washburn explained.

Greg Lanza, a graduate research student who assists Washburn in his experiments, said their research work involves accessing SAS on an almost daily basis. "We are completely computerized," he said.

"Six months from now, if I need to refer back to an experiment, I don't have to flip back through my data books and decipher what I find there. SAS stores and organizes data and affords easy access for specialized reports and complex statistical analysis, yet the package is easy to use and easy to teach," Lanza said.

Wide Appeal

The ease with which SAS can be used appeals to many researchers. Graduate student Sam Bowen uses SAS in his work. In experiments such as one studying the effects of diet and temperature on the incidence of muscular dystrophy in broiler breeder hens, SAS enables data to be collected and processed on physiological, pathological and production parameters on 600 birds. Considering the number of variables collected on each bird, hand calculations would be too time-consuming, Bowen said.

"SAS," he said, "enables me to use the computer as a tool without having to become a computer scientist."

Rachel Peavey, a lab technician for Washburn, had never used computers before learning SAS last year. Today, she routinely writes her own programs. "I am completely comfortable

(Continued on SR/16)

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Cincom Systems, Inc.
Systems Software Division

Dow Chemical Tests Financial Modeling System

By Robert W. Metzger
Special to CW

MIDLAND, Mich. — We at Dow Chemical U.S.A. decided in June to evaluate a financial modeling system in a two-month trial period to determine how well it would assist us in strategic long-range planning. Prior to that, we had evaluated several other modeling systems and found they required too much expertise on the part of the user.

We decided to try the Interactive Financial Planning System (IFPS) from Execucom Systems Corp. via Control Data Corp.'s Cybernet remote computing services for the two-month period. Sixteen people attended a one-day orientation seminar conducted by CDC in mid-June.

I was assigned to work half-time with one group of economic evaluators and planners.

I initially spent a two-hour session with each of eight people, at which time we developed a model and usually a report specification. After this session, each individual was left largely on his own to develop additional models, referring to me for technical questions and problems.

At the same time, several others developed IFPS models that received significant top management attention.

In early September, the sixteen people from the initial CDC session were surveyed. We found nine who were active users, three who apparently saw no application, three who had no time to work with the project and one who had been transferred.

The results of the trial period and an economic evaluation were presented to management in early October, and the decision was made to purchase IFPS and install it in-house. Installation was accomplished within one hour without a hitch.

All files were subsequently transferred from CDC's gear to our own in-house, time-sharing-oriented IBM 370/158 over a 24-hour period. This move also went without any problem, even though the machines and access methods of two different hardware manufacturers were involved.

Execucom conducted a two-and-one-half day training seminar in late November. Over 60 people attended the half-day management overview and 22 people attended the two-day in-depth training. The users clearly indicated that the system is easy to use, user-friendly and very effective.

In early December, about 40 people were using IFPS in five different U.S. locations. By spring the number of users could well double.

Metzger is with computer management at Dow Chemical U.S.A. in Midland, Mich.

Package Eases Data Entry Task

(Continued from SR/2)

mally and the next one in the queue is called up.

Data Entry Benefits

Time has found a whole series of benefits from using the data entry portion of BRGE. Data entry operators do not need to be specially trained to handle a variety of error conditions. On the other hand, problems are handled by people who specialize in particular kinds of problems.

Program bugs are more easily identified and fixed by having the exact data that caused the bug to appear. As an extension of that, BRGE provides an ideal mechanism for trying out new features without unnecessarily endangering the integrity of the data base.

Data entry operators are not bothered or slowed down by error conditions they couldn't handle anyway. Beyond that, the automatic reexecution of problem transactions and flush-through when the error does not recur assures that the transaction rerouting does not become a bottleneck for the whole operation.

File Conversion

The system also provides a good vehicle for file conversion in which old files are "translated" into new system transactions and processed by the new system to build its data base. At Time, the "translated" transactions were put on tape and then executed by the system as if they were coming in from a terminal.

BRGE works as well as it does because it was created by a team that followed an effective project implementation methodology. The existence of basic working logic units — Seiclam, for example — also helped, both Time and SEI agree.

But it was a combination of data base and system design by SEI and Time's well-ordered statement of requirements that really made the project work. The joint SEI/Time implementation effort throughout gave Time management good project control capability and Time technical staff expertise in the developed system.

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'Firmware Packages' on the Way

Applications Software Seen Firming Up in '80s

INDIANAPOLIS — Will firmware ever fully replace software in the marketplace? Certainly not before 1990.

When will we see applications firmware? Within two or three years.

What will be the major problems for vendors of applications firmware? To develop effective channels of distribution for the initial acquisition and the subsequent support of the package.

With that sequence of questions and answers, one observer who has been deeply involved in minicomputer software for 10 years summed up his view of the future of applications firmware. As president of Diversified Data Systems, Inc. of Tucson, Ariz., Donald W. Wyatt has had to consider what that future might hold for his firm and others like it.

Writing in the current issue of *ICP Interface/Administrative and Accounting*, published by International Computer Programs, Inc. here, Wyatt commented that "just as the decade of the '70s saw the emergence and broad acceptance of the 'software package,' the decade of the '80s will see the 'software package' largely replaced in the marketplace of the 'firmware package.'

Without getting into all the subtleties that a definition could entail, he said that "generally speaking," software in microinstructions or in machine code — stored in read-only memory (ROM) is referred to as firmware.

He also noted that the entire DP industry — others would say DP community, to make it clear user sites are included — is increasingly software-driven. "Software has emerged as the great value which determines the extent to which new hardware is utilized and exploited."

In keeping with the "memory is cheap" thinking that has become both realistic and all-pervasive, Wyatt said "several new products . . . which include, in ROM, the entire operating system, language compilers/interpreters, screen/forms manager, data base manager, report writer and other software . . . have emerged recently in the under-$20,000 class."

Reasons Behind Move

Firmware is being used by several large hardware manufacturers to package and distribute their standard system software products. According to Wyatt, this is done for several reasons:

- To simplify use of the system, since the user doesn't have to load fundamental software into the computer to do useful work.
- To reduce the size and cost of the system, since economies of scale can be achieved in the production of the ROM chips and since expensive peripheral devices are not required for system software overhead support.
- To increase the control and protection of "manufactured" software, since ROMs cannot be casually copied or exchanged by computer users.
- To reduce the cost of support and maintenance since all users have been "standardized" and modifying or tampering with the supplied package is nearly impossible.

There are also disadvantages to this use of firmware, he acknowledged: the initial cost of developing the firmware chip(s) is high; the cost of fixes or enhancements is the cost of new chips producing and replacing the old ones; temporary fixes and field modifications cannot be made; the "software" becomes "rigid" and special features or customization is nearly impossible.

Turning his attention to the subject of user applications, Wyatt said even though the benefits of firmware "could apply as easily to a standardized payroll package as to a Pascal compiler," there are "significant differences" which must be recognized.

As a general rule, applications software requires more tailoring by the user and is less palatable as a "rigid" package than a corresponding systems software package.

Beyond that, he said that with only a few current exceptions, software houses are orders of magnitude smaller than hardware manufacturers, "resulting in distribution volumes far below firmware economic break points."

Finally, Wyatt noted that "partly as a result of the smaller distribution volume," most applications packages do not quickly mature into stable, unmodified standard products that would be ideal for firmware implementation.

Dramatic Changes in '80s

On the other hand, he said three developments during the '80s "will dramatically alter these present circumstances." Applications packages offered by relatively small software houses on mini- and microcomputers will achieve distribution volumes previously unimagined, he asserted.

In the next decade, several mini- and microcomputer manufacturers will expand their software offerings to include basic applications packages, initially as "starter kits" from which users can build more elaborate logic. Several of these "kits" will gain wide acceptance and in fact become standardized routines for financial applications much as IBM's Bill of Materials Processor (Bomp) and material requirements planning (MRP) set the

(Continued on SR/12)

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$50 Million Increase in Four Years

System Serves Food Service Firm 350% Growth

By Patrick Conoboy
Special to CW

ELK GROVE VILLAGE, Ill. — Clark Products here has grown from a $20 million to a $70 million corporation in just four years — growth which would have been impossible without our computer system.

Clark Products has been in the food service industry for more than 51 years. It supplies condiments and paper goods to hospitals, nursing homes, restaurants and fast food chains such as Wendy's.

Because our business is characterized by a low profit margin, tight control of inventory and distribution is necessary. Four years ago, we decided it was time to install a computer system to effectively exchange information with our 18 distribution points across the country (mostly in the South and Midwest).

After considering proposals from several companies such as IBM, Honeywell, Inc. and Digital Equipment Corp., we decided on a system offered by Systems Management, Inc. (SMI) of Rosemont, Ill. The system consisted of a Microdata Corp. Reality computer, a printer, two CRTs and three modules (inventory, billing and accounts receivable) from SMI's Business Control Programs. The system was installed at our corporate office in February of 1976.

We picked the SMI system because we wanted both hardware and software from the same vendor and because the Microdata Reality had the English processor.

In addition, SMI's exclusive Real-time Programming Language (RPL) seemed the easiest language to use for developing our own software as needed.

With this as a beginning, we then started the task of coordinating the work of our distribution points to make sure we were getting all the information we needed on time. It took about two years for us to get everything running the way we wanted, but now our data processing operation is largely a matter of maintenance.

Using the SMI software as a base, an operator and I expanded the system to include sales, gross profits, commissions, budgeting, personnel data base maintenance and accounts payable. We are currently developing a general ledger program to fit into the system.

SMI's RPL greatly simplified the achievement of our goals. For example, our branch office in Louisville was having all its accounting work done by a computer service bureau at a cost of about $2,000 a month. With RPL, however, we had their applications up and running on our system within three weeks.

Before installation of our computer system, we were 18 separate entities — now we are one. We have added two Reality systems, each having 128K bytes of memory and 50M bytes of disk storage, as well as two printers and seven CRTs at our corporate headquarters where all processing is performed. Each distribution facility has a printer and two CRTs. Communications from the remote points to headquarters are relayed by phones and modems.

In addition to giving us vital information when and where we want it, computerizing our operations has helped to hold down personnel costs. Despite the fact that we have tripled our business, we still have just about the same number of employees and I still handle the data processing myself, with the help of an operator.

SMI is still our vendor and has been very helpful during our expansion, giving service and support where needed.

Its packaged software provided a good starting point on which to build.

As unbelieveable as it may seem, our original computer ran 14 months without any downtime or even a service call — and that machine ran 24 hours a day, seven days a week.

With the flexibility our system provides and SMI's continuing support in updating our system, we feel our system's capabilities are limitless. And although Clark Products expects to gross $100 million in 1982, we anticipate no growth problems with our system.

As a result of my experience here at Clark, I have developed an appreciation for the critical difference an effective data processing system can make in a company's future.

Conoboy is manager of information services at Clark Products, Elk Grove Village, Ill.

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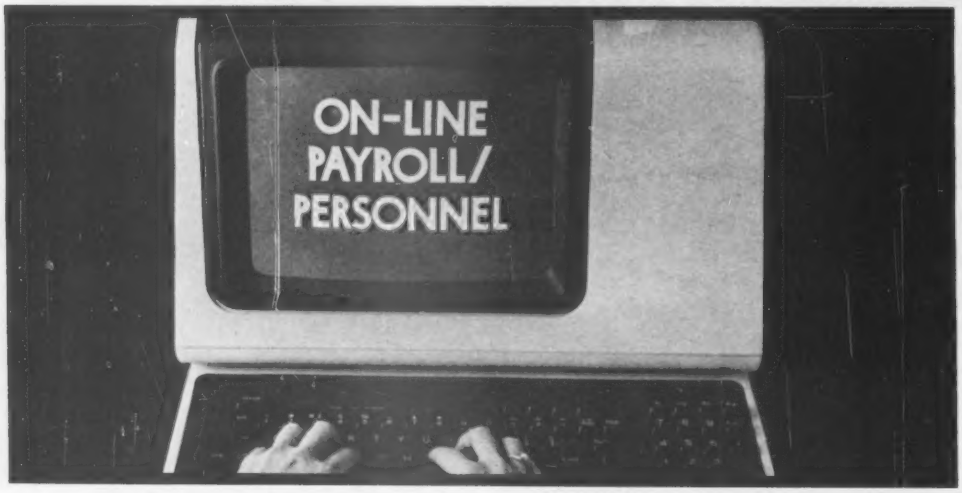

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'Terrible News, John — Our Computer Ran Away With the Blender.'

Accounting System Powers Utility Management

LAFAYETTE, Ga. — Although Lafayette, with a population of 8,000, is small, management of its $7 million operating budget is complex. That fact makes communications skills a necessity for Grady McCalmon, city manager for the past six years.

The city's $3 million indebtedness doesn't trouble McCalmon, but it does periodically upset citizens who compare Lafayette with a similar nearby municipality that doesn't owe a penny.

"Unlike the comparison city — which is totally dependent on private companies to deliver all basic utilities — Lafayette owns a 280-acre lake with a four-million-gallon water supply, a $4 million electric plant, as well as other utility-related equipment and a 200-acre industrial park. Currently, Lafayette doesn't have a bond rating.

"However, if we decided to enter the bond market for general funds or revenue bond issue monies, the city would have a fantastic financial record and tremendous assets to present. When critics learn the facts about Lafayette's fiscal health, they are usually impressed," the city manager said.

Utility Management

McCalmon, however, would be among the first to admit that there are potentially serious cash flow and administrative drawbacks associated with utility management. If not dealt with decisively, such hazards can offset advantages.

Had anyone asked McCalmon what he thought of utility ownership when he first was appointed in 1973, his answer might have been less enthusiastic. At the time, Lafayette was trying to process monthly utility bills on a fully depreciated manual billing machine that was in "deplorable" condition.

Bills frequently were mailed late and, too often, contained errors. Bill processing and accounting operations were labor-intensive, time-consuming and therefore costly. Lafayette really wasn't sure how many customers it served.

Almost every bill payer automatically was credited with an "early pay" discount, because there wasn't time to verify payment dates. Management reports were nonexistent, and capital asset accounting was haphazard. Of all the problems, however, tardy billing posed the greatest threat to Lafayette's financial stability.

"Another serious problem related to our old manual accounting system was its failure to provide good internal control of accounts receivable," he added. "We recognized this as a serious problem, and so did our auditors."

Delayed Conversion

The city was under contract with a DP vendor for a computer and software in 1973, when McCalmon was hired. But problems with equipment delivery and then programming delayed and finally canceled the first planned conversion to an automated system.

Lafayette installed an NCR Corp. 399 CPU in July 1974. It since has upgraded to an NCR 8150, which can handle both its utility billing system (electricity, gas, water, sewerage, garbage collection and security lights) and all of the city's general financial accounting applications.

"When we first entered data processing, utility billing was our main concern," McCalmon said. "We started at a fairly unsophisticated level. However, after we gained some experience, we wanted a more powerful machine that could allow us to try other financial programs."

Efficient utility billing and accounting, however, continue to be data processing's most important contribution to Lafayette's fiscal well-being, McCalmon said.

The General Utility System (GUS) software, developed for Lafayette by Ramm DP Consultants of Chattanooga, Tenn., and now being marketed by NCR, has helped the city increase its utility revenues and speed collections, McCalmon said. Cycle bills are sent on time each month. Customers have 10 days to pay a net discount total, and another 10 days to pay the undiscounted amount before service is terminated.

"Our revenues have increased because the computer automatically catches discount payments made after the cutoff date and bills for the difference," he said. "Our collection speed is better because accounts receivable reports identify delinquent customers for fast follow-up. Our accounts receivable records can be balanced quickly."

Accurate Information

Increased accuracy of information has been an important benefit of the accounting automation, McCalmon added.

"In the past, revenue was sometimes lost because the city couldn't document its claim that an account was in arrears," he explained. "Because so many people were pulling cards from the accounts receivable file, information could easily be lost."

Lafayette utility customers can pay bills by mail or in person at City Hall. When a bill is paid, the cashier enters the payment on an NCR 275 terminal, which records the transaction on a tape cassette as well as on paper tape. The cashier enters payments received by mail when window business is slow.

Later, all the transactions recorded on cassette can be entered into the NCR 8150 CPU automatically through a cassette reader.

(Continued on SR/16)

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A-33

Package Makes Aircraft Design Faster, Easier

Although the design and manufacture of a new aircraft is a complex and costly operation, the process of creating and implementing new designs is being made easier and faster at the Lakeland and Vero Beach, Fla., plants of Piper Aircraft Corp.

Credit for the change goes in large part to the Computer-Aided Design and Drafting (Cadd) software accessed through the remote computing facilities of McDonnell Douglas Automation Co. (McAuto). Cadd combines applied mathematics, computer science and CRT console procedures into a full, three-dimensional, interactive graphics package.

"We started with Cadd in late 1977," Marion Dees, Piper's vice-president of engineering, recalled. "We were looking for ways to reduce our total manpower requirements and engineering costs. In addition, the system would have to increase the output of engineering drawings and do it in less time than in the past."

Dees and his staff considered several systems before turning to McAuto. "I was skeptical, but the Cadd presentation and the solution of some sample problems indicated the system could be applied to our needs." Dees was convinced a demonstration project was in order to verify the potential savings in manpower and time.

Piper decided to try Cadd on an experimental project very similar to others that had been done manually. Accurate costs and schedules accomplished were available for the comparison. In addition, the selected trial project had been planned manually. Piper made a direct comparison of costs of a project done manually with costs of a similar project using Cadd.

At its Lakeland plant, Piper installed a Tektronix, Inc. graphics terminal linked via 1,200 bit/sec telephone lines to McAuto's IBM 370/168s in St. Louis. Technical consultants from McAuto helped Piper through the trial project.

Operation of Cadd

The actual operation of Cadd involves design engineers sitting at a CRT terminal keyboard and creating three-dimensional designs. An electronic stylus and tablet can be used with preprogrammed engineering routines, or engineers can digitize two-dimensional points with the stylus from another drawing placed on the terminal graphics tablet.

Piper design engineers entered the data required and Cadd created the completed drawings needed for both tooling and assembly. Within several months, the trial project was completed and the research vehicle was in the air.

"The trial program did not save us any appreciable amount of money, but we did complete the project, using Cadd, in far less time than would have been required manually," Dees said.

"We gained sufficient experience on the trial program and confidence in the potential of Cadd to use it for the creation of engineering and tooling drawings for the Cheyenne III T-Tail. This time, we saved on cost and time required. We are operating efficiently with Cadd and getting better with it every day."

"Many of the Experimental Design people were skeptical of Cadd when we first brought it in," according to Tom Cook, Advanced Engineering Program manager at Lakeland. "We normally provide our Experimental department people with dimensioned drawings for skins; they lay it out by hand and trim it to fit on assembly of the prototype. The first time we used Cadd, we gave them a non-dimensional skin drawing. Experimental left exactly one-quarter inch excess on it, expecting to have to trim the skin. And they did — exactly one-quarter of an inch. Cadd was right on the money. From then on, they were really sold."

'Beautiful' Results

"The project we accomplished on the trial program resulted in the most beautiful piece of workmanship I have seen on a first experimental article," Dees added. "It looks like production article number 100, not experimental article number one." And Dees should know good workmanship; in more than 25 years in aircraft engineering, he has worked on the design of more than 25 aircraft with Lockheed, Rockwell and Piper.

"There is a saving in using the computer because there are far fewer errors in engineering drawings, tool designs and in making the tools. That is difficult to quantify, but it is actually there," Dees said.

Cadd is not the only sophisticated computer system Piper is using to create bigger, faster and more fuel-efficient aircraft. Fastcut, a sussystem of Cadd, allows Piper numerical control output for puch presses and two-, three- or five-axis milling/drilling machines from a graphics terminal. With Fastcut, Piper's staff can create numerical control output automatically and within minutes. It can do this at a reduced cost, without parts drawings, and produce interchangeable assemblies. Machine personnel do not need special training to operate Fastcut, and that attracted Piper.

Tony Morley, engineering program manager at Vero Beach, expects Cadd and Fastcut to play an important part in Piper's Future. "From the tooling standpoint, one of the biggest things that came from our beginnings with Cadd was the ability to split the aircraft into subassemblies for fixtures, orient the parts into positions most efficient from a working standpoint and create multiple coordinate systems. Each fixture has its own coordinate system and through Cadd can be instantly cross-checked to other fixtures and the master geometry. This is a big time saver."

"I can build tools without the computer. But I feel I can build better tools, more economically, with the computer. You find you eliminate much of the human error," Leon Mitchell, manager of tool engineering at Vero Beach, agreed.

Piper has discovered that Cadd improves communications between operating divisions. Beside its two manufacturing locations in Florida, Piper has one in Lock Haven, Pa., and in Santa Maria, Calif. With Cadd transmitting over telephone lines, all Piper offices could look at any given design on the terminal simultaneously.

Engineers can create designs in Cadd and transmit them to other engineers for review. But only the originator can alter the original design. Copies of the design can be made electronically, and other engineers can alter the copies. "This capability," Dees added, "means additional expertise is available without adding personnel."

Piper's Cheyenne III, an 11-seat turbo-prop aircraft, will be Piper's latest offering in the general aviation market. The unique 'T-Tail' was designed with McAuto's Cadd program.

Firming Up in This Decade

(Continued from SR/9)

standard for inventory control applications in the '60s.

In the third place, Wyatt said, new channels of distribution for software products will emerge and these will foster strengthened marketing and distribution capabilities through the pooled resource networks of dealers or distributors.

With the increased volumes represented by these changes, the applications firmware package will become a reality in the '80s. Packages will be supplied on one or more ROMs, which will be inserted into a device — "perhaps called a ROM-reader or ROMR" — which will permit the computer to execute the application logic.

Specialized or customized functions will still be accomplished through software which will integrate with the firmware package. Mass storage access and integrity will be controlled by sophisticated data base managers. Powerful query systems will eliminate the need for most retrieval and reporting software, he continued.

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Controls Multisite Operation

Company Knows Energy Use Within 1.5%

By Fred Klein
And U.V. Subba-Rao
Special to CW

MORRIS PLAINS, N.J. — Shortly after the energy crisis of 1973, Warner-Lambert Co.'s Consumer Products Group embarked on a low-profile energy program. It soon became evident that production and weather fluctuations, together with rate changes, masked true energy usage to such an extent that it was almost impossible to measure progress with traditional cost methods.

Like many other firms having serious energy management programs, Warner-Lambert adopted the British Thermal Unit (BTU) as its base figure in monitoring energy usage.

Developing an index that would give management a tool to indicate progress in energy conservation proved difficult because the Consumer Products Group produces such a wide variety of products — from sunglasses to baked goods — within a multiplant network.

Choosing an appropriate way of expressing results was also troublesome. In most of our facilities, weather has more effect on energy use than does production. However, changes in weather account for only about 60% of the use, with other variables also contributing. Furthermore, the effect of weather changes on use depended also on geographical location.

Instead of relying upon the traditional ratios to report progress in energy conservation, industrial engineering and management science personnel developed individual mathematical models for each location, based on variables peculiar to that facility.

The resulting output is a monthly estimate or standard against which actual BTU consumption can be measured. Given long-range weather projections and production and man-shift/hours, the forecast of energy use by location can be developed.

First Attempts

In 1977, energy use data was collected by type of fuel and location. This, together with production and weather information, became the data base for the system. An econometric analysis of the data was then expected to reveal relationships among consumption, production and climatological variables.

We proceeded to implement this system using software already on hand — a data management language, an econometric analysis package and a number of Fortran-based report writers. About six man-months of a senior programmer/analyst/operations research analyst's effort was expended.

However, the variety of systems being used meant that reporting required nearly a week of the analyst's time each month. Changes — in location or otherwise — were very cumbersome to accommodate.

Consequently, a comprehensive investigation of various planning languages was made for the Energy Forecasting and Reporting System. Partly because we had had some exposure to the Simplan package (from SSI in Chapel Hill, N.C.) and could foresee its use in other applications as well, that was our choice for the energy management.

With a six-week effort, we managed to implement the entire system.

After receipt of all actual production data from the various locations, industrial engineering personnel can now update the data base and execute the jobs necessary for creation of all the reports in only half a day, a substantial savings over the former full week. Equations are re-estimated quarterly or as needed by the Management Science Function. Some locations require use of the auto-correlation correction procedures.

The first year of full operation was 1978, and in the last quarter a use and cost projecton for 1979 was prepared for each location. Through the third quarter of 1979, the error between actual and estimated energy use was less than 1.5%.

The oil-producing nations and inflation have not cooperated with our projections; we expect the cost error to be much higher than estimated. However, knowing the amount of energy used, comparing this amount with an estimate and disseminating the resulting reports was enough to reduce energy consumption levels.

Klein is director of industrial engineering and Subba-Rao is manager of management science for Warner-Lambert Co.'s Consumer Products Group, based in Morris Plains, N.J.

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Telecommunications Firm Builds on 'Empire'

NASHVILLE, Tenn. — "We have an extremely aggressive, rapidly growing company in a high-technology area, where forward planning is an essential part of the management process.

"To retain flexibility in this environment, we needed a financial planning system that was very adaptable and would fit into a dynamic environment where organization structure and reporting requirements change unpredictably in response to business needs," Robert Newman, manager of financial planning systems at Northern Telecom, Inc. (NTI), said recently.

"The electronics industry is burgeoning, and some of our divisions are growing at rates in excess of 40% annually. It's a tough environment and requires a strong business orientation from its financial managers in order for them to successfully support management," he added.

NTI is a wholly owned subsidiary of Northern Telecom Ltd., based in Montreal. The company, which recently reported annual revenues of approximately $1.5 billion, operates in two main business areas: telecommunications equipment and electronic office systems. It is the second largest manufacturer of telecommunications equipment in North America, and NTI is the leading supplier of digital switching systems to the independent telephone market.

Newman joined the company as a senior financial analyst last March and was involved in the automation of financial analysis and planning systems.

"I was dealing with financial reports required for budgeting, forecasting, planning and analyses such as capital funds expenditures and new product analyses. All of these functions are appropriate to automate with a competent modeling language since the numbers are usually not hard and fast and people ask speculative 'What if types of questions about the data," he said.

Selection Process

NTI had earlier recognized the need to upgrade its financial planning systems capabilities and had determined to purchase a management information/financial information system with a modeling language as part of a comprehensive systems development program started in 1978.

"Our steering committee evaluated about 30 different modeling packages — some offered via time-sharing and others on a stand-alone basis," he noted. NTI needed a system that would provide management with timely, reliable financial data that would also permit analysis and consolidation of the financials of the U.S. affiliated companies.

"Some of the comparisons we did in our selection process included the ability of the package to implement income statements, balance sheets, return on investment, ratio analysis and other standard computations, as well as the ability to generate subsidiary schedules. We were looking for a comprehensive system with general financial and modeling capabilities," Newman added.

The steering committee selected Empire, an interactive modeling, analysis and reporting system marketed by Applied Data Research, Inc. (ADR). The decision was made to use Empire to prepare division and consolidated budgets utilizing Empire's flexibility to build in audit checks as an aid to maintaining full integrity of the data.

Empire is fundamentally an interactive modeling system, providing users with extensive capabilities in the areas of report writing, data management, graphics, statistical analysis and simulation. With logic for most standard financially oriented computations, some of its applications include the ability to describe business relationships in an understandable and usable fashion, manage data at both the detail and summary level, assess risks associated with uncertainties and examine relationships of data over time.

Benefits of System

"Some of Empire's benefits are more obvious than others. For instance, we have used the system to consolidate financial statements. The consolidation seems to have improved the morale of NTI's financial analysis staff mainly because we've been able to automate their tasks and they don't have to work through the night massaging numbers," Newman said.

He explained that NTI division controllers can now prepare budget data with fast turnaround, enabling NTI to reduce clerical costs and allow time for editing using the audit test checks which are built into Empire. In addition, corporate consolidation time and costs have dramatically been reduced, allowing more time for analysis of the data. "We have minimized the time spent on "number crunching" and maximized the available time for analysis," he noted.

For Newman, a key issue in selecting a modeling package was whether the package was designed for a programmer, an econometrician or a financial analyst. "The designers of Empire seem to have had an analyst in mind. Its modeling language is simply written and it has functions built into it that an analyst can really appreciate, such as a routine for spreading a number based on a percentage," he pointed out.

According to Newman, at every U.S. division there is at least one analyst familiar with the Empire system. "We made sure every division had a terminal and some familiarity with the language that our computers use. After we finished the programming of our 1980 budget package, we went to each division and explained Empire to them, told them how to run it and gave them a timetable within which to input the figures," he said. Ultimately it is anticipated that all Northern Telecom divisions worldwide will be consolidated through Empire.

As a forecasting tool, Newman has confidence in Empire's abilities. "Using our former manual methods, our 24-month rolling forecasts were too cumbersome, costly and time-consuming. With Empire, however, we will be able to prepare a much more sophisticated forecast because the ADR product has the reporting, statistical and modeling capabilities to handle it. Integrated with our general ledger data base, forecasts will become a much more powerful management tool," he said.

Package Sales Seen Growing 29%

(Continued from SR/3)

While IDC forecast overall growth in the packaged software business, in the applications package segment of that business and in each of the primary applications areas within that segment, it also anticipates some distinct shifts of user interest — as measured by revenue dollars — going into the application segment in the next four years.

Based on telephone interviews with 50 leading software suppliers, IDC found that in 1977 the total $235 million revenue pie included a 19% slice for payroll/personnel systems, 15% for banking, 15% for insurance, 17% for manufacturing, 19% for accounting and 15% for other applications.

By the 1983 timeframe, the study expects both banking and insurance to drop off to 10% each, with manufacturing taking up only 14% and accounting just 16% of the total.

It's worth noting, however, that even though each of these percentages will be down, the revenues for each class will be up, since the total pie will be a whopping $1.276 billion.

Up in both percentage and revenue, if the IDC figures hold, will be the payroll/personnel area — which the researchers expect to make up slightly less than a quarter of the market — and "other applications," which will rise just above the 25% mark.

Growth Factors

Commenting on growth factors, IDC said that increasing labor costs and federal legislation are causing many organizations to consider better methods to manage their human resources effectively.

That explanation for the expected "significant growth" in the market for personnel applications confirms the comment of one particular vendor spokesman who recently said "the government" has provided his company with a whole new market every five years.

Concern about worker productivity and the changing patterns of energy and other raw material availability are among the factors that make the potential market for manufacturing applications "very promising" in IDC's view. Various industries are seeking better solutions to their problems, the report noted.

The non-IBM computer market, including minicomputers, "offers another avenue of growth for independent [software] suppliers," although IBM's "extraordinary" concentration of accounts in industries such as insurance will block profitable growth into those areas.

IDC also noted, without much extra comment, that the trend toward distributed data processing will have a major impact on the application software market.

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Thirty-Six States Still Undecided

To Tax or Not to Tax: The Software Question

By Don Leavitt
CW Staff

Has your organization been assessed taxes on software it has acquired from outside sources? Has it paid the tax, or has it fought — or is it fighting — the assessment?

The mere fact that such questions could even be asked points out the confused state of the issue of software taxation — if indeed it is an issue at all.

More than a dozen states have waffled on the issue in the past few years, imposing the taxes and then, under one legal pressure or another, retreating to a greater or lesser degree. These states include Alabama, Arizona, Florida, Louisiana, Minnesota, New Jersey, New Mexico, New York, Ohio, Rhode Island, Texas, Vermont and Wisconsin.

Early in 1979, Massachusetts authorities agreed to publish proposed regulations before they went into effect. By year-end, however, opponents of software taxation reported that the bureaucrats had implemented a plan that would lead to taxation on a different basis.

Little has been heard from the other 36 states. It isn't clear whether this quiet continues because no taxes have been imposed — perhaps because a state doesn't have a sales-and-use tax (a favorite vehicle) — or because the taxpayers consider the taxes justified and have paid them.

"The Good Old Days"

Back in the "good old days" of the 1960s when software support most often came directly and without extra cost from the hardware vendor, it apparently never occurred to vendors, users or tax authorities that software was a valuable asset that should be taxed.

That all changed, of course, in the '70s as IBM unbundled and started charging separately for its software — thereby spawning the software industry. The sheer number of computer sites grew explosively, and states and lesser jurisdictions intensified their searches for new tax dollars.

The reasoning of the taxing authorities was quite straightforward: if the using organizations thought enough of this "software" — whatever it was — to pay for its acquisition, it obviously was a valuable asset. Therefore it should be and could be taxed, they argued.

The counterarguments, stated in terms just as direct were equally persuasive, at least in the minds of the proponents: nowhere in fact does the software have a tangible existence. Because most of the tax laws used keyed on tangible property as the basis for assessment, such laws don't apply to software.

Pro and Con

Those do indeed sound like two opposing views of one subject, with conflict enough for many a tax hearing, legislative debate or judicial dispute. And the fact is that in 14 different states, at one time or another during the '70s, the opponents of software taxation raised their points and won their battles.

Even in the states where the opponents seemed to prevail, the advocates of software taxes tended to find ways around the roadblocks. These opponents could not rally many DP managers (and even fewer lawyers) to their side, leaving the impression that the fight seems to have gone out of the effort to oppose the imposition of taxes.

Previously one of the most outspoken opponents of software taxation, Bob Sherin, president of Miami-based Nova Computers, Inc., said recently that he gave up the fight shortly after the National Computer Conference last June. He lost his resolve, he said, when only four people — "out of more than 50,000 attendees, for gosh sakes" — showed up to hear a panel discussion on the subject.

Sherin still believes there is a serious constitutional issue involved in the assessment and payment of taxes on such intangible property as software. He was clearly disappointed by the NCC "debacle" and by the ruling of a federal appeals court which threw out his suit against the state of Tennessee as "frivolous."

Sherin originally got involved in the taxation issue when authorities in Florida assessed taxes against his firm. Because he is not an attorney, he fought back — successfully — through an administrative hearing rather than in a courtroom.

The situation in Tennessee ultimately involved all branches of government and illustrates, perhaps as well as anything, how confused the issue can become. Since 1976, the state has seesawed from one definition to another of "tangible personal property."

The first ruling in the matter came in the case of Commerce Union Bank vs. George Tidwell, the state's tax commissioner. The Tennessee Supreme Court declared software intangible and therefore not taxable.

The next year, however, Gov. Ray Blanton signed into law S.B. 224, which put software in the category of tangible personal property and made it subject to the state's 5% sales and use tax, effective July 1, 1977.

(Continued on SR/22)

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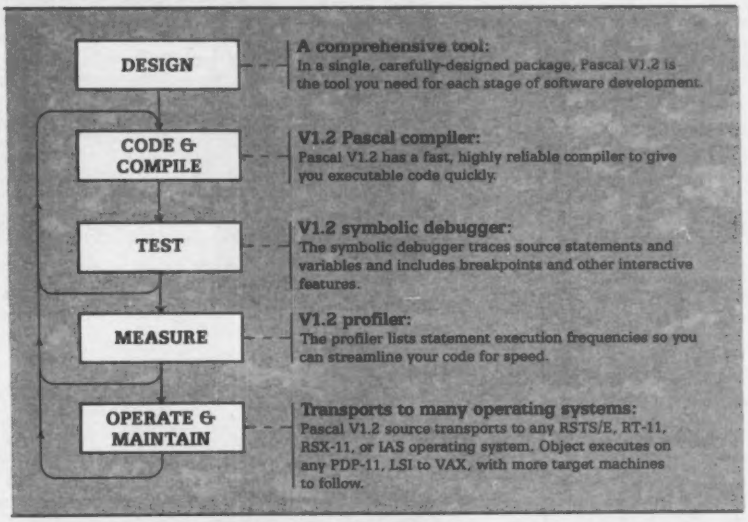
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Package Eases Dozens of Poultry Applications

(Continued from SR/7)

with the entire operation," she said.

She is also pleased with the speed with which the computerized method works.

"We finished an experiment yesterday at noon," she noted by way of example. "I had punched and entered the data by yesterday afternoon, wrote the program this morning and had the results in Washburn's hands by 1 p.m. Using the older method, it would have taken all yesterday and today just to finish the arithmetical calculations, much less starting the analysis.

"Just using the computer to sort the data has meant a substantial savings of my time."

SAS has also made its way into the offices of poultry Science. Debra Riddling, who serves as a secretary for four professors, uses SAS for a mass mailing each year of the Georgia Nutrition Conference. The mailing — approximately 1,500 addresses — is now handled by SAS and takes far less time than it used to.

"That has meant a savings of at least two weeks of work time for me," she said, adding "the work is done more efficiently than ever before. Since I can print out the data by any variable I choose, the mailing list is better organized than ever before.

"Updating the list is much easier — when someone drops off, I simply throw away the card with his address. It's even lowered duplication costs. I have been amazed with how much the package can do," she said.

Riddling, who now handles the entire computerized mailing process, says it took her approximately a week to learn to handle the system set up for her by Sharlin.

"SAS is an ideal package — both for experienced and novice users," Sharlin said.

He finds the package appealing for a number of reasons. First, the language is very like English, which makes the programs understandable to novice users. It has many prewritten procedures for beginners, but also contains programming statements for more complex or specialized tasks.

"When I was at Beltsville, Md., doing statistical analysis for a variety of plant and animal scientists, we never found an application SAS couldn't handle. Nor did we find a data manipulation problem for which at least two different approaches couldn't be taken," Sharlin claimed.

"In fact, the computer and SAS are an integral part of my work; the only problem is that SAS runs only on large IBM and IBM-compatible computers."

Sharlin believes computers should become an established part of the work of the Poultry Science Department, since they can take a lot of the drudgery out of work, making for increased efficiency and more job satisfaction.

"I don't see any reason for the computer and SAS not becoming an established tool of most departments on this campus," he added. "SAS designers' philosophy was that data processing needs are very similar between users. Only the nature of the variables changes."

Software Powers Utility Accounts

(Continued from SR/11)

"The savings in staff time has been substantial," McCalmon said. "The system has also reduced and redistributed the entire work load so the current staff has more time to devote to other projects."

Cost reductions have cropped up in other expense categories, too. Audit trails and other control features that make the system "impossible for one person to beat with a scheme" have reduced the complexity of audits and the associated costs, the city manager noted.

The computer automatically prints the city's meter reading sheets complete with customer names, account numbers, previous meter reading and other data.

Extra Benefits

As Lafayette continues to fine-tune its utility programs, it reaps extra benefits. Now in the planning stage is a programming enhancement which would automatically kick out bills for accounts with usage far above or below normal consumption patterns.

The city manager credits Lafayette's other DP financial accounting systems with similar cost savings and administrative gains. General funds, encumbrance accounting for nine city departments, for example, has improved the ability of McCalmon and the city council to keep departmental spending within budget limits.

Detailed line-item expense reports for each department aid in cash flow management and budget planning, McCalmon added.

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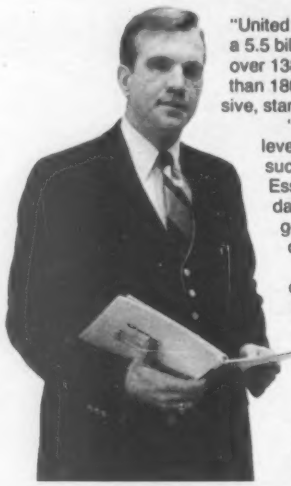

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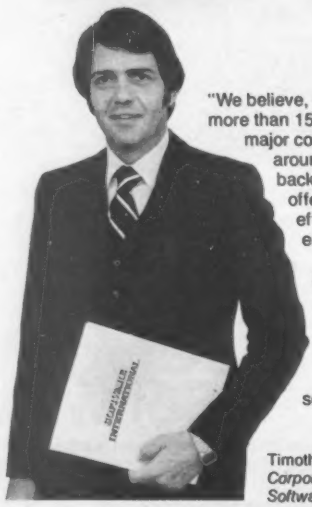

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Update Slated for March Release

Directory to List 3,200 'International' Packages

By Don Leavitt
CW Staff

LONDON — Even DP folklore often has a basis in fact. But sometimes it's the apparent contradictions that make life interesting.

Conventional wisdom has long held that systems and utility software find broad-based acceptance in Europe, but applications packages cannot be mass marketed anywhere but in the U.S.

The fact is that accounting systems closely tied to laws and government regulations — payroll systems, for example — are not generally adaptable across national borders. But other, more general applications — for financial planning, project management and the like — pose no real problem related to where they are being used.

In any case, there is a growing collection of packages of all types from numerous vendors and developers all around the globe, and that is the rationale behind the *International Directory of Software*. This directory is being updated and will be republished in March in a greatly expanded form, according to Editor-in-Chief Robert Grant.

This particular directory got its start here in the UK. The first edition (1977) included standardized, formatted listings of some 800 products. The updated version will be a hardcover book with 1,100 pages covering some 3,200 products.

Whereas the 1977 effort was mounted by CUYB Publications Ltd. here, the 1980-81 edition is a joint operation of the parent organization and newly established New York-based CUYB Publications, Inc. That shift is a reflection of the real world, Grant commented.

"Cross-Fertilization"

Some remarkably successful and effective software packages — Software AG's Adabas, Software Design, Inc.'s Grasp and Computer Associates, Inc.'s CA-Sort among them — had their origins outside the U.S., but "something like 80%" of the software that is transportable from installation to installation does come from the States, he estimated.

Of course there are some very good packages that have been built in the UK and then taken to the States, where their marketing "just blossomed." The Modular Application Systems (MAS) from Arbat Systems Ltd., now offered by Martin Marietta Data Systems, is one example; the software that supports users working with the Swift electronic funds transfer network is another, Grant said.

Certainly the "cross-fertilization" of thought that has gone into computer-aided design/computer-assisted manufacture (CAD/CAM) has helped that particular application area immensely, he added.

Returning to the subject of software sales in Europe, Grant said there are a number of reasons, quite beyond the need to keep up with the laws and regulations of multiple nations, that affect the scene over here.

Directory Editor Robert Grant

Users in Europe generally might be seen as several years behind their U.S. counterparts in accepting the concept of packaged solutions to their problem. Selling packaged software is a hard job. Users have to be strongly convinced that a product will do what the vendor claims and that it will meet the user's needs.

Users with that approach must have a test period, according to Grant. They are perhaps more skeptical of vendor claims than their American "cousins" are, and they are only interested in reference user sites if they are in the same country. Certainly packages offering installation by mail and no on-site vendor support tend to get a cold shoulder, he added.

In Germany, the "Not Invented Here" syndrome — which puts anything from outside an organization at a disadvantage — is probably stronger than it ever was in the States, Grant said.

Britain and ICL

The picture in the British Isles is rather different from that in the rest of Europe for two apparently contradictory reasons, according to the editor.

There is, he feels, a more severe shortage of well-trained programmers and analysts here. That should mean packages are welcomed as a means of overcoming this shortage. But things aren't that simple.

Some 40% to 50% of the installations here are based on equipment from the

(Continued on SR/22)

uses the same System in the Corporate Office."

"Here in the Corporate Treasurer's office, we use Software International's General Ledger and Accounts Payable systems to support the financial activities of six of the smaller UTC subsidiary companies. In addition, we have taken advantage of the accounts payable system to use it for Job Order Costing, maintaining complete traceability for specific contracts. The combination of Ledger and Payables provides an effective reporting tool, particularly useful in budgeting applications."

John Gritman
Manager of Financial Services
United Technologies Corporation

"An illustration of the General Ledger's flexibility is its operation in Bogota. Annually, the Colombian Government requires a detailed report of all payments made to vendors. One of the General Ledger system's standard reports enables the Bogota office to prepare this report automatically, thereby eliminating significant clerical effort. The system can also produce financial reports in either Spanish or English, as well as perform the necessary currency conversions.

"Naturally, all user-interface with the system is in Spanish. Yet this is the same system that operates in English — or other native languages — at other UTC facilities around the world."

Jerome Kelly
Manager, Management Information Systems
United Technologies Corporation

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Publisher Finds 'Slang' More Than Acceptable

GLENVIEW, Ill. — Six years ago Scott Foresman, the $229 million book publisher here, was looking for a software system to help it do the myriad of one-time reporting jobs performed by its bustling DP department. At the same time, a brand new information retrieval system was being marketed by a Chicago-area firm. It didn't take long for the two companies to get together, and Scott Foresman became one of the first users of Slang.

Today, Scott Foresman is still going strong with Slang and is helping NCI, Inc. of Atlanta — which recently acquired the marketing rights to Slang — put its newest product on-line.

Programmer/analyst Marc Century quickly became the company's resident Slang expert when he joined Scott Foresman four years ago, and he has enjoyed finding new applications and experimenting with Slang ever since.

"You never know when you will need a certain application and believe me, my experiments have paid off," he said. "In fact, I find that reports which start out as a one-time request are asked for many times after because we can fulfill the requests so quickly."

Plans for Change Dropped

Six months ago, Scott Foresman began looking for a faster report writer to add to its software library, but those plans were dropped when Slang was acquired by NCI. Scott Foresman had been using Slick, the library management system from NCI, as well as the NCI on-line programming system OWL, and knew NCI would enhance and upgrade Slang.

"Besides, Slang can do most things the other packages I've studied can do," said Century. "We like it and felt there was no need to spend money on a new product and then face the costs of reprogramming. Sure, there are fancy options offered by some other products, but they really are not basic to any of our needs.

"I feel Slang is the easiest system to learn since it takes less than a day for a programmer/analyst to feel comfortable with it and become productive. It's definitely the easiest language to write because it's all English-oriented and there's no need to memorize intricate instructions or options because the manual is laid out well enough to be considered a finger-tip reference. But above all, I think Slang is by far one of the most flexible report writers I know of."

Important in Billing

Century and other programmer/analysts keep the Scott Foresman DP operation running on an IBM 370/135 under DOS/VS. The programmer/analysts use Slang every day, and even their departmental secretary has written a few Slang jobs.

One on-going and important use of Slang is connected with the publisher's billing system, which involves order processing, billing and inventory control and runs 10 to 16 hours a day. While Cobol still is the primary programming language, Slang is used to help the DP department prepare data for processing and perform manipulation of data.

Changes are made quickly and smoothly, Century said, and since tapes are not saved from one day to the next, Slang is used to capture data from disks during and between jobs. Calling this a real "time-saver," Century pointed out that the DP operation can now often avoid time-consuming Cobol programming.

Inventory Control

In addition to processing invoices, shipping memos, inventory control, accounts payable and receivable for the Glenview location, Century and his associates handle DP operations for Scott Foresman offices in New Jersey and office/warehouses in Georgia, Texas, California and Indiana. Inventory control is a big concern since the DP department must keep track of well over 9,000 different book titles throughout six locations.

A year ago, Slang helped with a company-wide warehouse reorganization. Now all books can be stored in the same or alternate locations in all warehouses.

When an employee plans to visit a warehouse, he will ask the Glenview DP center to create a report giving warehouse location and alternate location for particular books. These reports, mailed to the warehouse and waiting for the visitor when he arrives, take less than an hour to produce with Slang.

"One of the best uses I've found for Slang is creating test data from live master files, which allows me to duplicate records. It's great to be able to read test files right from a disk either in character or hex format instead of using ditto," Century said.

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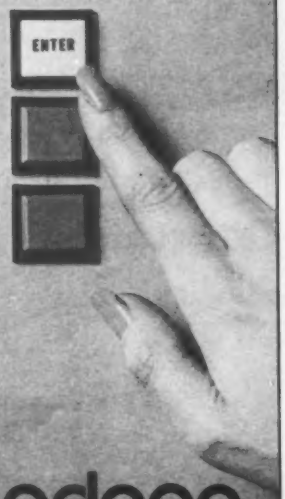

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'Almost Unlimited Use' Seen

Auditing Package Proves Lipton's Cup of Tea

By Robert E. Farrell
Special to CW

ENGLEWOOD CLIFFS, N.J. — When the position of corporate DP auditor was created by Thomas J. Lipton, Inc., one of the first assignments for the person hired was to select an audit software package that would facilitate not only the DP aspects of auditing, but also would assist other staff auditors in performing both operational and financial audits.

After reviewing surveys and reports on available packages, we narrowed the field to what we felt were the three best available. We approached each vendor for presentations of their products.

Price was not an important determining factor in the selection. Rather, we were concerned with the overall operational efficiency of the package, the ease with which it could be installed and maintained, its ability to access diverse file structures and the ease of coding applications. This latter point was important because it was our intention to have all of the audit staff learn to use the package.

After hearing the presentations of representatives of the three vendors, we chose to purchase the Audit Analyzer from Program Products, Inc. (PPI).

Quick Results

From the first day of our three days of training, we were impressed with our selection. The speed with which non-DP auditors grasped the basic principles of data processing and the Basic Command Language of the Analyzer was a tribute to our instructor.

Using our own general ledger file, we successfully completed not only the File and Data Definition (FDD) required for all files, but also our first useful application of comparing departmental budgets with actual year-to-date expenses. In three days, we succeeded in producing a report which we will often use again against perhaps the most complex file in the Management Engineering Services (MES) library.

Anticipating the scope of our work load for the following year, we immediately began defining the areas in which the Analyzer could assist us. Surprisingly, we did not find one audit on our list where the package could not be used.

More importantly, we found we were able to extract the information we needed without any assistance from systems personnel, thereby maintaining the independence required for proper performance of our job. Some of the applications we have performed using the package follow.

Sample Applications

We selected a random sample, using one of the available sampling PROCs, of individuals from the year-to-date payroll file. In the same run we requested a count of records and a printout of earnings and tax figures corresponding to the W-2 forms to be mailed to employees. The count allowed us to verify that the number of W-2 forms printed agreed with the records on file.

It also tied in the payroll amounts to the general ledger. This procedure proved to be a significant time-saver for controlling the W-2 mailing and accounting for the accuracy and reliability of the payroll information.

During a review of the accounts receivable and credit functions, we were able to produce our own aging of outstanding balances plus a separate run showing all customers whose balances exceeded their credit limits. This report is procedurized and can be run at any time, especially during peak selling seasons. It has subsequently been requested by the corporate credit manager.

We are in the process of writing a confirmation routine that will print confirmations for all or some of our customers as of a specified date. Without the assistance of the package, this would be extremely time-consuming.

We have succeeded in producing a report of off-invoice allowances given to customers for meeting certain buying criteria or for advertising or couponing our products. We sample these items to see that the provisions of the allowance have in fact been met.

Another report is produced which shows year-to-date payments made to vendors; these payments are then sampled according to their general ledger codes. A subsequent review assures us that proper purchasing procedures were followed in acquiring the item. We can also subsample these items for payments made for radio, television and print media advertising expenses, which are considerable for Lipton.

Anticipated Uses

Realistically, the applications for which the Analyzer can be used are limitless. We anticipate developing further applications — reviews of "no charge" orders, overrides of price codes, reasons for adjustment orders, changes to payroll files and a host of reports relating to the operating system using SMF data.

Our package is used with Applied Data Research, Inc.'s Roscoe through our own terminal. The new Roscoe output processor allows us to review

(Continued on SR/22)

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The Standard CIS COBOL compiler requires a minimum 48K configuration. It is a super-set of the Compact compiler and implements ANSI 1974 COBOL to full Level 1 standard. Among its advanced features are program segmentation and interprogram communication which make it ideal for implementing or converting large systems using modular programming.

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Because CIS COBOL is a validated ANSI '74 standard COBOL, your applications will be easy to maintain: more professional programmers know COBOL than any other language.

And because CIS COBOL conforms fully to the standard, programs written with it are portable — so if you move up to a mini or mainframe, you will be able to take your software with you.

Equally, CIS COBOL can enable mainframe COBOL programs and programming tasks to be offloaded to less expensive microcomputers. Mainframe programmers love the ease of use of CIS COBOL and they achieve results fast running it on a desk-top micro.

Forms

The FORMS utility lets you build a screen layout online at the CRT. Then it automatically generates complete COBOL record descriptions for inclusion in your program — saving you time and leaving you free to concentrate on processing.

Forms-2

The FORMS-2 program generator — an extension of FORMS — completely eliminates the need to write simple data entry and enquiry programs. Using it, an entire CIS COBOL source program can be generated automatically from screen definitions — and it works, first time.

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CIS COBOL products run on the 8080 or Z80 microprocessors under the CP/M* operating system, and on the LSI-11 or PDP-11 processors under RT-11. They are distributed in a variety of disk formats, and have a CONFIG utility supplied as standard, enabling you to drive many different types of CRT. All are themselves written in CIS COBOL, and are therefore self-compiling and readily transferable to different operating environments — including new operating systems and new microprocessors. All of which makes CIS COBOL a very attractive proposition for OEMs as well as end-users.

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Chemical Maker Gets $15,000 Payables Tool . . .

By George P. Colburn
Special to CW

CLIFTON, N.J. — Essex Chemical Corp., headquartered here, produces and sells industrial and specialty chemicals. It also manufactures nonrelated products including Christmas decorations and mobile electric generators.

Employing approximately 750 people in 13 manufacturing and warehousing facilities across the U.S., the company also operates one of the larger tank-truck fleets on the East Coast.

Of more immediate interest, Essex is a user of packaged software, including an accounts payable system that enabled us to save $75,000 — five times the cost of the package — in our first year of use, just from vendor discounts we would have missed otherwise.

Essex only recently changed from using a service bureau to operating an in-house data center, primarily to gain better financial control. The installation of an IBM System/3 some 24 months ago gave us the ability to substantially improve information available for management decisions, as well as significantly tighten control of cash flow.

Almost simultaneous with the arrival of the System/3, we began to investigate application packages. In the chemical industry, raw materials are very costly. Our accounts payable function (which handles $1 million to $2 million of invoices for 11,000 vendors) did not provide complete billing information because it was a straight forward one-to-one system of one-voucher-equals-one-check.

This system did not provide information or flexible timing that would let us take advantage of discounts allowed for early payment. As a result, thousand of dollars in discounts were lost each month because of an oversimplified and unresponsive way of paying bills.

Other Needs

We had other needs as well. Essex has a multidivision corporate structure, and each division is handled by a different bank. Each division produces different kinds of industrial and consumer products. We therefore needed the ability to write checks from many banks, to include all credits from each vendor during each check run and to specify maximum amounts for checks.

On a larger scale, we wanted the assurance of complete auditability and, most importantly, the management control given by commitment, distribution and disbursement reporting.

In-house development of an accounts payable package was eliminated as a viable alternative. With our small DP staff, it was not feasible to dedicate a programmer or analyst to an eight or 12-month development project.

Furthermore, payables is a relatively standard application, and we didn't want to "reinvent the wheel." Our logical choice was a purchased application software system.

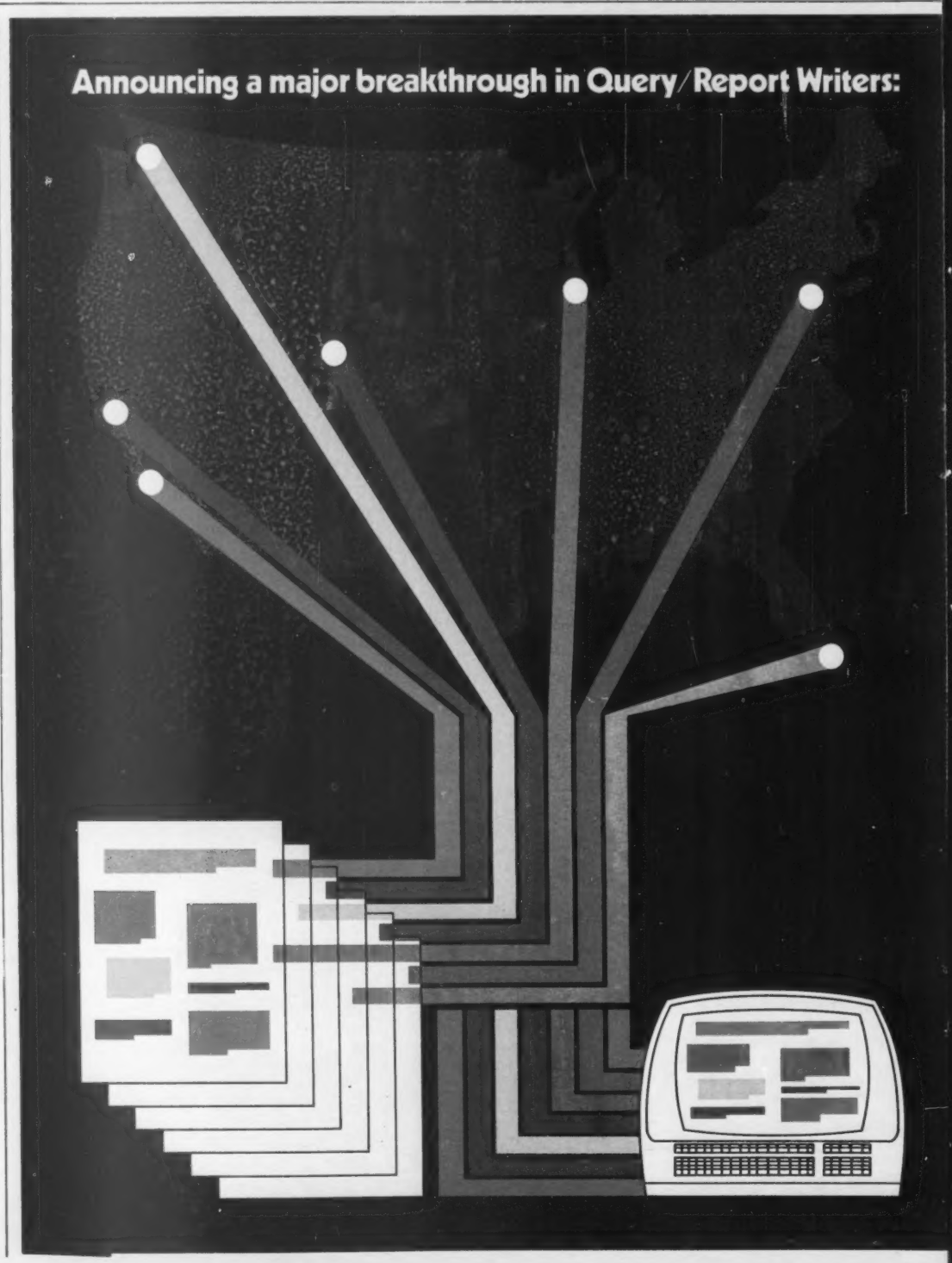
After a careful study of our needs, including research into general ledger accounting requirements, we bought Software International's accounts payable and general ledger systems. The accounts payable system was installed immediately; the general ledger installation was delayed for a little more than a year because of intervening projects in manufacturing areas.

The same concerns that make in-house development of application software impractical — such as limited time and resources and the need to respond to many user departments — also made the quality of vendor support a key factor in our decision process.

We wanted to purchase a product that would work well in the basic application area, that could be modified to handle some of our special processing and reporting needs and that would be fully supported both during and after installation.

Our decision was reinforced by the excellent documentation provided with the system and the support that accompanied the installation process. Installation was accomplished in only two days, and we were fully operational, producing checks and supplying a wide range of management reports, within one month.

The accounts payable instal-



. . . Saves Five Times That Amount in First Year

lation went smoothly from both system and human points of view. The input forms are easy to use and follow the documentation so that there are no surprises. With no more time spent preparing input, more useful management information is provided than with the previous service bureau system.

The group supervisor, who formerly spent most of her time preparing and validating manual checks with the service bureau, can now use the reports produced by the system to really manage the payables area.

One of the most significant and important features of the accounts payable is that it is extremely easy to modify. User fields are provided for special purposes so that, with minor modifications, we have been able to customize our system to suit our needs exactly.

The system provides processing and reporting capability for complete expense control and cash disbursement management. We have a wide variety of output reports and system functions that provide a solid basis for managing the payables area. The system handles everything from input of vouchers to distribution, disbursement and management reporting, including commitment reviews and vendor analysis. Most importantly, from our point of view, it gives us the information we need to save thousands of dollars in discounts.

At the time of input, we can provide optional data to direct the performance of additional functions such as 1099 reporting, bank reporting, the creation of separate checks for each invoice and special handling of checks. The system optionally supplements the clerical input function by automatically scheduling payment dates. Payments can be scattered over the accounting period based on the invoice date and the particular terms of payment for that vendor.

Discounts Computed

In addition, the system can compute appropriate discounts using either percents or amounts. The automatic rescheduling of recurring payment items (such as rent) based on predetermined criteria is also provided.

A large portion of general ledger entries originates in the accounts payable area. Since Software International general ledger system has been installed, we have a full interface capability that supports complete, accurate and automated distribution of payments to general ledger accounts. Journal entries are generated on request during the accounting period, and we can specify distribution options of cash or accrual and detail or summary.

General Ledger

Several features of the general ledger system that make it extremely useful as a management reporting tool are:

- The free-form account numbering structure means that within a 24-character range there are no restrictions on the account number at all — no specific field assignments. This allowed Essex to maintain its existing accounts numbering system while still identifying accounts in such a way that reports can be made and summaries taken by many various parameters.
- The relationship feature lets us summarize or roll-up posting level data in an unlimited number of ways. Labor costs can be summarized by department, plant, company, product or even by individual employee. Managers are thereby given access to standard information in a variety of useful ways.
- The variable report writer (VRW) lets us design reports in a variety of formats. Virtually any information in the system can be retrieved, manipulated and printed in any format. We produce regular detail and summary reports for budgeting, cost accounting, product management, raw material purchases and travel and expense control.

There are many factors that affect the selection, installation and operation of an application software package at a given company; here at Essex, our choice really has been good chemistry.

Coburn is director of management information services at Essex Chemical Corp., Clifton, N.J.

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To Tax or Not to Tax: The Software Question

(Continued from SR/15)

In March of 1978, H.B. 2026 was passed, deleting software from the tangible property category but redefining it as something that was sold. As a result, the tax remains.

Joined later by the Data Processing Management Association, Sherin went to court to fight that law. Last summer the U.S. Court of Appeals in Cincinnati found the issue "so unsubstantial as not to need further argument."

In its ruling, the court noted that "an aggrieved Tennessee taxpayer" has the legal remedy of paying a tax under protest and then suing for recovery of the payment "as having been wrongfully collected."

While Tennessee lumped all kinds of software together, a much narrower fight was taking place in Rhode Island.

Starting back in 1977, Puritan Life Insurance Co. petitioned for a review of the sales and use taxes levied on its application software. Early last year, the company's view — that the taxes had been imposed erroneously — prevailed, but Rhode Island authorities said other cases would still be considered individually. The ruling last spring clarified that, while Rhode Island law calls for the taxation of software "needed to make the computer operate," the software in question at Puritan was applications software and therefore not taxable.

The authorities apparently felt that application programs involved "a great deal of professional services on the part of [their] vendors," and to the extent of that service such programs are not subject to the tax.

An off-the-shelf package would probably still be subject to the tax, in the view of Ed Goldkamp, the hearing officer in the case.

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CW/210

Package Suits Lipton to a Tee

(Continued from SR/19)

the output prior to printing, and it gives us the alternative of flushing the results if we do not elect to do any further work. Corrections to applications can also be made more quickly and efficiently.

In addition to developing our own applications, we have used the library of the Analyzer International Users Group, Inc. (AIUGI), created at the 1978 Analyzer Users Conference. This library of enhancements and user applications can be obtained by any member for a nominal charge.

The library contains the applications of many tried-and-true users and acts as a real sharing tool for all members. In addition to this interchange of applications, the group broadens the knowledge of participants not only through the interaction of ideas at the user conference, but also through a telephone network of members, an idea which has really caught on.

For those times when problems are encountered in getting a program running, one phone call to the PPI Technical Support Group generally produces a solution. If the problem is complex, the group may need to return your call, usually on the same day. These people are a delight to work with and are extremely knowledgeable regarding the Analyzer.

We are extremely pleased that we selected the Analyzer. While we do not use any of the add-ons, such as the IMS Interface or On-Line Analyzer, we have heard nothing but good things from users who have tried them.

Farrell is corporate DP auditor at Thomas J. Lipton, Inc. in Englewood Cliffs, N.J.

Directory Update Lists Packages

(Continued from SR/17)

government-backed International Computers Ltd. (ICL). Quite apart from the fact that the base includes gear from several ICL series, the machine architecture is quite different from IBM's — pretty well recognized as the de facto standard. Even the use of Cobol doesn't solve the transition problems that entails.

ICL has apparently recognized the problem and supplies its users with a lot of application packages, Grant continued.

Non-ICL shops, however, are too limited a market to be served effectively by software vendors, who almost by definition must be concerned with volume to make a profit.

DDP Different

Perhaps because of the generally smaller size of even the large corporations and the somewhat delayed move into DP over here, the mainframe market in England has not expanded as much as it has in the U.S.

Grant sees distributed data processing (DDP) systems taking hold here in a way that may provide leadership for the rest of the world. DDP is different, he contended, and the British experience will be useful to many organizations as the move is made into the more dispersed environment.

Echoing the thoughts of many, Grant also noted, in conclusion, that he sees an explosive growth in microprocessor-based operations and, with that, a comparable surge in application software for the smaller units.

Users Give Commands in English

Collegewide System Copes With Present, Future

By Sister Carolyn Winschel
Special to CW

PITTSBURGH, Pa. — In choosing a software application package for our administrative operations, we at LaRoche College were interested in a complete, well-documented package and an end-user-oriented computer system. To achieve these ends, we conducted a needs analysis and a survey of similar-size colleges before investigating possible application programs.

After an extensive study of available software packages, we selected four for final consideration. On-site demonstrations were arranged with the vendors. Existing documentation was also studied, and current users were polled for their feedback.

The main criteria for evaluation at this stage were cost, institutional fit, the hardware on which software packages could be run and the quality of support.

Package Choice

The administrative software package finally chosen was the Academic Institution Management System (Aims), provided by Modular Software Concepts, Inc. (MSC). The accompanying hardware was a Honeywell, Inc. Level 6 minicomputer system utilizing a special operating system provided by the Ultimate Corp.

From the 12 available modules, we picked 10 from the Aims package: Admissions, Registrar, Financial Aid, Alumni/Development, General Ledger, Accounts Receivable, Accounts Payable/Purchasing Inventory, Student Payroll, Personnel/Payroll and Student Loan.

We were able to keep modifications of these modules to a minimum because they were well-developed and had originally been chosen for their institutional fit.

The hardware configuration chosen consisted of a 64K-byte Honeywell Model 4303, with a 75M-byte disk, four CRTs (Applied Digital Data Systems, Inc.'s Regent 25), an 800 bit/in. tape drive and a 300 line/min printer. The Model 43 is expandable to a 2M-byte main memory, 1G byte of disk capacity and 256 terminals.

The Honeywell/Ultimate system in combination with the Aims software provides many advantages including support for a dictionary-driven data base management system, variable length files and records, an interactive time-sharing system, virtual memory, a special language called Recall and a spooler system.

The end-user orientation was an especially important feature for us at La Roche College since we did not wish to hire a DP staff.

Some problems were encountered in the installation phase, most of which originated from a new combination of the Honeywell hardware, the Ultimate operating system and the Aims applications.

However, Honeywell, Ultimate and MSC personnel resolved the difficulties. The installation process was slowed down a bit, but within two months the system was running relatively smoothly.

One of the system's unique features is the setup of the data bases and the flow of data. Modules in the student information system share a common file of data, and each office or administrative function has access to specific information from that file.

A potential prospect's record is begun in the admissions office when an inquiry is received. When the prospect files an application and becomes a formal applicant, additional data is added to that already input.

When the student is accepted and has paid a deposit, biographical data from Admissions is made available to the registrar's office. The student may then register for classes.

After a student has registered, pertinent information is accessible by those handling students accounts recievable, and the student is invoiced. Accounts receivable personnel can flag a student as being officially registered when his account has been cleared. The names of these students can now be entered on official class rosters.

This process of building up the data file on each student continues through his tenure at the institution. After graduation, the student's biographical data and other relevant data is accessible by the alumni office, where alumni personnel can continue to use and build on each individual record.

The financial information system is tied together in a similar fashion, but there is less actual sharing of data by the various functions. The financial and student information systems share common data when appropriate.

The Recall language makes the Ultimate/Aims system more flexible than many turnkey systems. The user can give English commands to obtain data in a variety of formats. Data elements in varying combinations can be counted, listed, selected and sorted according to dictionary elements.

These features provide the user with required data on students, classes, alumni, donors, personnel and finances. Provision is made also for a long range budgeting process and a faculty evaluation system.

Sister Winschel is director of special projects at La Roche College.

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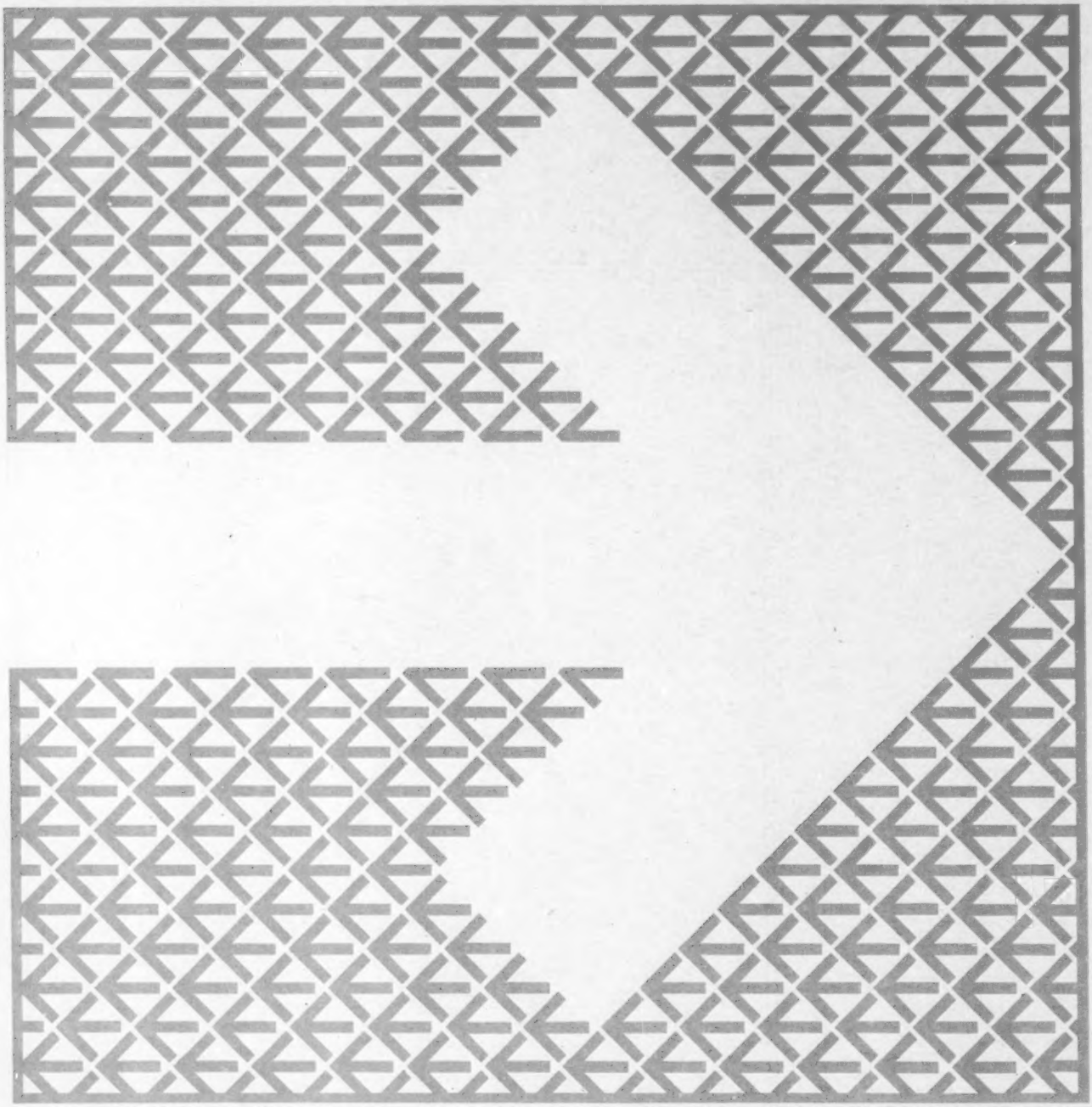

BECAUSE MANAGING DATA MEANS MANAGING CHANGE

Computer Corporation of America

THE THREE GREAT DATA MODELS

An introduction to the relational, network and hierarchical models.

By Jeffrey D. Ullman

In Chapter 1 we mentioned the role of a data model as a basis for data definition and manipulation languages. Now let us consider the three most important such models — the relational, network and hierarchical. In subsequent chapters we shall explore the relational model predominantly, for reasons we shall discuss at the end of the chapter, after we have had a chance to see the three models in detail. Briefly, the relational model provides the descriptive power of the other models with fewer distinct concepts to learn or special cases to handle. Chapters 4-6 will discuss aspects of the relational model in detail, including a number of high-level data manipulation languages that have been developed for this model.

However, the present state of the art is such that existing commercial systems are almost exclusively based on one of the other two models, a situation that is expected to change slowly. We shall in later chapters consider the hierarchical and network models in some detail too, covering the dominant system designs in these two categories, IBM's hierarchical IMS (Information Management System) and the DBTG (data base task group) network proposal.

3.1 The Relational Data Model

The mathematical concept underlying the relational model is the set-theoretic *relation*, which is a subset of the Cartesian product of a list of domains. A *domain* is simply a set of values. For example, the set of integers is a domain. So are the set of character strings of length 20, the real numbers, the set $\{0,1\}$ and so on. The *Cartesian product* of domains $D_1, D_2, \ldots, D_k$, written $D_1 \times D_2 \times \ldots \times D_k$, is the set of all k-tuples $(v_1, v_2, \ldots, v_k)$ such that v_i is in D_i, v_2 is in D_2 and so on. So, if $k = 2$, $D_1 = \{0,1\}$ and $D_2 = \{a,b,c\}$ then $D_1 \times D_2$ is $(0,a), (0,b), (0,c), (1,a), (1,b), (1,c)$.

A *relation* is any subset of the Cartesian product of one or more domains. As far as data bases are concerned, it is pointless to discuss infinite relations, so we shall assume that a relation is finite unless we state otherwise. For example, $\{(0,a), (0,c), (1,b)\}$ is a relation, a subset of $D_1 \times D_2$ defined above. The empty set is another example of a relation.

The members of a relation are called *tuples*. Each relation that is a subset of $D_1 \times D_2 \times \ldots \times D_k$ is said to have *arity k*. A tuple $v_1 v_2 \ldots v_k$ has *k components; the i^{th}* component is v_i. Often we use the shorthand $v_1 v_2 \ldots v_k$ to denote the tuple $(v_1, v_2, \ldots, v_k)$.

It helps to view a relation as a table, where each row is a tuple and each column corresponds to one component. The columns are often given names called *attributes*.

Example 3.1: In Figure 1 (on In Depth/2) we see a relation whose attributes are CITY, STATE and POP. The arity of the relation is three. For example, (Miami, Oklahoma, 13880) is a tuple.

If we attach attribute names to columns of a relation, then the order of the columns becomes unimportant. In mathematical terms we view tuples as mappings from attributes' names to values in the domains of attributes. This change in viewpoint makes certain relations equal that were not equal under the more traditional definition of a relation.

Example 3.2: Figure 2 (on In Depth/2) shows two versions of the same relation in the set-of-mappings point of view. For example, as a mapping f, the tuple (Buffalo, W. Va., 831) is defined by f(CITY) = Buffalo, f(STATE) = W. Va. and f(POP) = 831. Note that the order in which the tuples are listed makes no difference in either viewpoint. However, in the traditional view of a tuple as a list of values, the tuples (Buffalo, W. Va., 831) and (W. Va., 831, Buffalo) would not be the same, and the two relations of Figure 2 would not be considered the same.

As existing relational systems allow the printing of columns of a relation in any order, we shall take the set-of-mappings definition of relations as the standard one. However, there are situations, such as when we discuss relational algebra in Section 4.1, where we shall want to use the set-of-lists definition for relations. Fortunately, there is an obvious method of converting between the two viewpoints. Given a relation in the set-of-lists sense, we can give arbitrary attribute names to its columns, whereupon it can be viewed as a set of mappings. Conversely, given a relation in the set-of-mappings sense, we can fix an order for the attributes and convert it to a set of lists.

Relation Schemes

The list of attribute names for a relation is called the *relation scheme*. If we name a relation REL, and its relation scheme has attributes $A_1, A_2, \ldots, A_k$, we often write the relation scheme as REL($A_1, A_2, \ldots, A_k$). We should observe the analogy between a relation scheme and a record format as well as similar analogies between a relation and a file and between a tuple and a record.

The difference in each case is one of the level of abstraction. That is, one possible implementation, among others, for a relation is as a file of records with a record format equal to the list of attributes in the relation scheme, and with one record for each tuple.

(Continued on In Depth/2)

This material is excerpted from Chapter 3 of a new book, Principles of Database Systems, *by Jeffrey D. Ullman. ©1980, Computer Science Press, Inc. All rights reserved. The book is available from the publisher at 9125 Fall River Lane, Potomac, Md. 20854 for $19.95 plus $1.25 for postage and handling.*

IN DEPTH

CITY	STATE	POP
San Diego	Texas	4490
Miami	Oklahoma	13880
Pittsburg	Iowa	509

Figure 1. A relation

CITY	STATE	POP
Buffalo	W. Va.	831
Providence	Utah	1608
Las Vegas	N. M.	13865

STATE	POP	CITY
Utah	1608	Providence
W. Va.	831	Buffalo
N.M.	13865	Las Vegas

Figure 2. Two presentations of the same relations

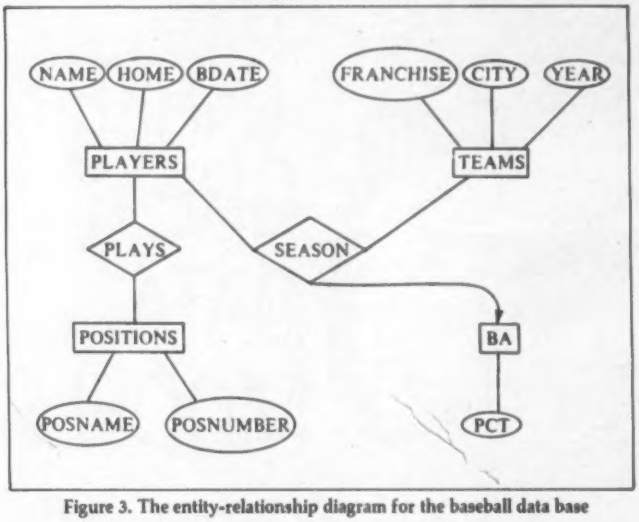

Figure 3. The entity-relationship diagram for the baseball data base

NAME	HOME	BDATE
Ruth, George	Baltimore, Md.	2/6/1895
Cobb, Tyrus	Narrows, Ga.	2/18/1866
Robinson, Jack	Cairo, Ga.	1/31/1919

PLAYERS

FRANCHISE	CITY	YEAR
Red Sox	Boston	1917
Dodgers	Brooklyn	1949
Tigers	Detroit	1911

TEAMS

POSNAME	POSNUMBER
Pitcher	1
Catcher	2
First base	3

POSITIONS

NAME	POSNAME
Musial, Stanley	First base
Cobb, Tyrus	Center field
Cobb, Tyrus	First base

PLAYS

NAME	FRANCHISE	YEAR	PCT
Musial, Stanley	Cardinals	1948	.376
Ruth, George	Red Sox	1917	.325
Ruth, George	Yankees	1923	.393
Cobb, Tyrus	Tigers	1911	.420
Robinson, Jack	Dodgers	1949	.342

SEASON

Figure 4. Part of the five relations for the baseball data base

(Continued from In Depth/1)

However, one can conceive of many other implementations for a relation, and some of these will be discussed later in this section.

Representing Data In the Relational Model

The collection of relation schemes used to represent information is called a *(relational) data base scheme*, and the current values of the corresponding relations is called the *(relational) data base*. We are, of course, free to create relations with any set of attributes for a relation scheme, and we can place any interpretation we wish on tuples. However, we can observe the typical pattern of usage if we recall one discussion of the entity-relationship model from Section 1.4. The data of an entity-relationship diagram is represented by two sorts of relations:

1. An entity can be represented by a relation whose relation scheme consists of all the attributes of the entity set. If this entity set is one whose entities are identified by a relationship with some other entity set, then the relation scheme also has the attributes in the key for the second entity set, but not its nonkey attributes. Each tuple in the relation represents one entity in the entity set.

2. A relationship among entity sets $E_1, E_2, \ldots, E_k$ is represented by a relation whose relation scheme consists of the attributes in the keys for each of $E_1, E_2, \ldots, E_k$. We assume, by renaming attributes if necessary, that no two entity sets have attributes with the same name. A tuple t in this relation denotes a list of entities $e_1, e_2, \ldots, e_k$, where e_i is a member of set E_i, for each i. That is, e_i is the unique entity in E_i whose attribute values for the key attributes of E_i are found in the components of tuple t for these attributes. The presence of tuple t in the relation indicates that the entities $e_1, e_2, \ldots, e_k$ are related by the relationship in question.

Example 3.3: Let us explore a data base that records baseball players, the teams they played for, their batting averages and positions played. Before showing how data of this nature can be represented as relations, let us consider the entity-relationship diagram that represents the "real world" as it pertains to this example. The entities are:

1. PLAYERS, with attributes
   NAME
   HOME /* place of birth */
   BDATE /* date of birth */
   Attribute NAME is a key.
2. POSITIONS, with attributes
   POSNAME /* e.g., pitcher */
   POSNUMBER /* 1 for pitcher, 2 for catcher . . . */

   Either attribute can serve as a key, but we shall take POSNAME as the key.
3. TEAMS, with attributes
   FRANCHISE /* explained below */
   CITY
   YEAR

   The FRANCHISE attribute is a unique identifier we give to a baseball franchise. As a franchise is property, it has existence as an entity even when it moves to another city or changes its name (e.g., the Cincinnati "Reds" have been called the "Redlegs" for two different periods of their history).

   In all example cases, we use the current name of the franchise as the value of FRANCHISE. A *team* (as opposed to a franchise) is the collection of players, coaches, etc. working for a franchise in a given year. The key for the entity set TEAMS is FRANCHISE and YEAR.
4. BA, the set of batting averages. This entity set has one attribute, PCT, whose values are three digit numbers between 0 and 1. Clearly, PCT is the key.

We shall also discuss the following relationships:

1. The relationship SEASON between PLAYERS, TEAMS and BA. Player p, team t and batting average b are related by SEASON if p played on team t, and his batting average was b. Notice that SEASON is a ternary relationship. It is many-one from PLAYERS and TEAMS to BA, in the sense that given a player and a team, that player has a unique batting average. Recall that a "team" exists for one particular year, so the typical player is on many teams and has many batting averages, but just one batting average per year.

2. The relationship PLAYS between PLAYERS and POSITIONS. This is a many-many relationship indicating what positions were played by a player over the course of his career.

The entity-relationship diagram is shown in Figure 3. We draw an arrow from SEASON to BA to indicate that SEASON is a many-one from PLAYERS-TEAMS to BA.

Now let us select relation schemes to represent the entity sets and relationships. First, we have a relation scheme for each entity except BA. While there is no prohibition against a one-component relation (called a *unary* relation), such a relation would tell us nothing. It is merely a set consisting of all the possible batting averages. The

three relations for the other entity sets are:

PLAYSERS(NAME, HOME, BDATE)
TEAMS(FRANCHISE, CITY, YEAR)
POSITIONS(POSNAME, POSNUMBER)

The relationship PLAYS is represented by a relation whose attributes form the keys for entity sets PLAYERS and POSITIONS. Each of these sets has a one-attribute key, NAME and POSNAME, respectively. Thus we introduce a relation:

PLAYS(NAME, POSNAME)

For relationship SEASON we need the keys of PLAYERS, TEAMS and BA. These are NAME, (FRANCHISE, YEAR) and PCT, respectively, so we also have the relation:

SEASON(NAME, FRANCHISE, YEAR, PCT)

In Figure 4 we see some sample tuples that would appear in these five relations if they contained all current data (Source: Turkin and Thompson, *The Official Encyclopedia of Baseball*, Barnes and Co.). Notice that tuples need not appear in any particular order, and we certainly do not show all of them. For example, the SEASON relation has tuples for Ruth for all years between 1914 and 1935.

Implementing a Data Base

The obvious way to represent a relation is as a file whose record format consists of fields corresponding to the attributes in the relation scheme, in some particular order. Many data definition languages based on the relational model allow the user to specify, from among options, the organization of the file. The options available are usually a subset of those described in Sections 2.2 through 2.5, such as hashed or indexed. Another alternative, which may be the best for relations with few tuples, is the "heap," where the tuples are listed as records in the file in no particular order. A second useful feature found in many relational data manipulation languages is the ability to specify **secondary indices** on certain attributes or sets of attributes.

As many file organizations are dependent on the existence of a key for records, a relational data definition language should also provide a mechanism for specifying one attribute or set of attributes that forms a key for the relation. The notion of a *key* for a relation is essentially the same as that of "key" in the context of files or entity sets. A relation is presumed not to have two tuples that agree on all the attributes of the key. For example, NAME and YEAR form a key for the relation SEASON in Figure 4. We do not expect to find two tuples like:

NAME	FRANCHISE	YEAR	PCT
Ruth, George	Red Sox	1917	.325
Ruth, George	Yankees	1917	.302

since we assume each player played for one team only in a given year (or in the case of a trade, we record only the team on which the player finished the season).

Clearly the attributes that form a key for the relation also serve as a key for the file. It is interesting to note that if we design our relation schemes according to the method outlined above, the relations for the entity sets adopt a key from the entity set. Also relations constructed to represent many-one relations from entity set E_1 to set E_2 can adopt the key of E_1. It is only relations for many-many relations that may have no key smaller than the trivial key consisting of all attributes. The general subject of finding and using keys in relations has been well developed, and we shall explore some of the theory in Chapter 5.

Let us emphasize that there is no requirement that each tuple be represented by a record, although this arrangement is by far the preferred implementation in existing systems. For example, a relation with attributes *A*, *B* and *C* could be represented by a logical file with variable length records of format $A\ (B(C)^*)^*$, and this logical file could be implemented in one of the ways suggested in Section 2.6.

This arrangement saves space if there are relatively few values in the domain of attributes *A* and/or *B*. For example, the TEAMS relation of Example 3.3 could be represented conveniently as the logical file FRANCHISE(CITY-(YEAR)*)*. FRANCHISE has the smallest domain, there being only two

(Continued on In Depth/6)

Small Business Systems Surveyed

Microdata Reality Gets Top User Rating

Microdata Corp.'s Reality, Basic/Four Corp.'s Model 400 and the IBM System/3 models 6, 10 and 15 reaped the highest marks in Management Information Corp.'s (MIC) fourth annual small business systems users survey.

To assess how well small business systems are meeting users' needs, MIC polled 568 companies that use 689 small business CPU's.

Each respondent was asked to subjectively rate the vendors and their products on performance (whether stated equipment specifications have been realized), reliability (uptime vs. downtime), ease of use (amount of time necessary to train new personnel), service (maintenance) and vendor support (such as advance training and program assistance).

A four-point rating scheme was used (1 = poor, 2 = fair, 3 = good, 4 = excellent). The survey results were given as averages of the ratings assigned to each product in each of the five categories.

The Microdata Reality, Basic/Four 400 and System/3 Model 10 and Model 15 were the only small business systems to receive ratings of 3.0 or higher in all five categories.

Taking the average of all five categories, the Microdata Reality topped the field with a score of 3.66 (based on 27 respondents using 55 units). The Reality earned 3.8 in performance, 3.8 in reliability, 4.0 in ease of use, 3.4 in service and 3.3 in support.

Based on nine respondents with nine units, the average for the IBM System/3 Model 15 was 3.6. This system was rated 3.6, 3.8, 3.6, 3.7 and 3.3 in performance, reliability, ease of use, service and support, respectively.

Eight users with 17 Basic/Four 400's gave that system an overall rating of 3.5. In performance, reliability, ease of use, service and support, the system was rated 3.5, 3.4, 3.8, 3.4 and 3.4.

Following this order, the IBM System/3 Model 10 was rated 3.3, 3.5, 3.3, 3.3, and 3.3, respectively, by 34 users with 45 units. The System/3 Model 6 received 3.4, 3.7, 3.7 and 3.1 ratings in performance, reliability, service and support, respectively, by eight users with eight units.

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Skip Little,
Supervisor of Systems Analysis and Systems Programming,
VAX Computer Group,
Woods Hole Oceanographic Institution,
Woods Hole, Massachusetts

Scientists at the Woods Hole Oceanographic Institution gather massive amounts of data about the earth's oceans. But until recently the only way they could analyze much of that data was by sending magtapes to and from a giant Cray 1 computer located 1800 miles away.

So the Institution decided to buy its own VAX from Digital.

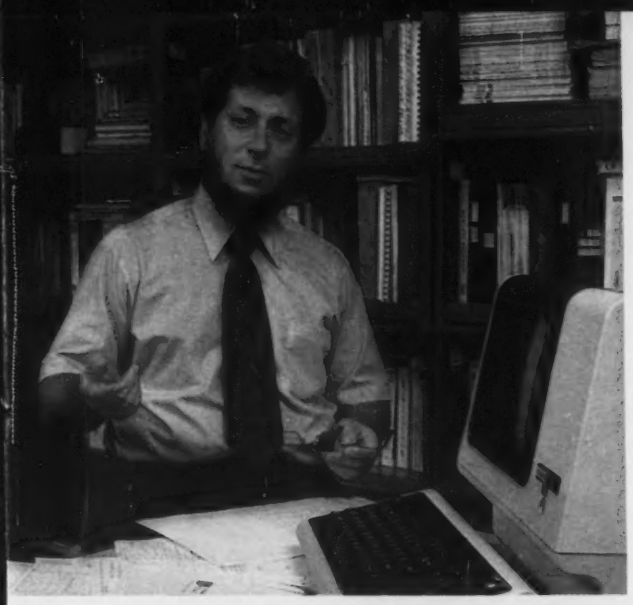
Here's what Skip Little, Supervisor of Woods Hole's VAX Computer Group, has to say about VAX program capacity: "Some of the smaller versions of Cray modelling programs can actually be run on VAX. That's remarkable because the Cray 1 computer is the world's most powerful commercially-available system."

Now the problems they had in doing large data analysis and timesharing simultaneously are a thing of the past. Says Little, "We're able to lock our biggest jobs—like synthetic seismogram generation and fluid dynamical modelling—into VAX's main memory, while other timesharing users can be handled by the virtual memory system."

And Little has found that program conversion is a breeze: "We've converted programs from practically every kind of computer you can imagine with great ease."

"With VAX's virtual memory, there isn't a PC board around that's too large for LASAR to handle."

Fred Grant,
LASAR Product Manager,
Teradyne, Inc.,
Boston, Massachusetts



Teradyne, Inc. makes a wide range of automatic test equipment including computer-based systems for testing printed circuit boards. To help their customers program the most complex of these PC board test systems, Teradyne developed a sophisticated software package called LASAR.™

But until Teradyne looked at Digital's VAX-11/780, LASAR was only available to customers through a timesharing service on a large batch-oriented mainframe. The software package was just too big for anything less.

Now with LASAR running on VAX, Teradyne will have the program capacity they need, in a system their customers can afford to purchase.

"When you reach the limit of main memory, VAX automatically puts the program into virtual memory," Grant says. "That's a key factor in our LASAR development work. Test programmers can develop more complete programs without being limited by memory size."

Has Teradyne sacrificed performance by switching from the mainframe?

"Definitely not," says Grant. "In our benchmarks, VAX matched up one-to-one with the mainframe. That really impressed us."

And VAX's interactive capability should be a big plus for Teradyne's customers: "Several people can program on VAX simultaneously, and they can monitor the progress of their programs as they work.

"There's more programmer involvement with VAX, and more efficiency too."

"Without Digital's VAX, our specialized design work just wouldn't be as cost effective."

Stephen Tritter, Senior Principal Engineer, Engineering Computer Facilities, E-Systems, Inc., ECI-Division St. Petersburg, Florida

The ECI Division of E-Systems, Inc., designs high-technology electronics and communications equipment for the U.S. Government. And that requires huge computer programming space.

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IN DEPTH

(Continued from In Depth/3)

dozen or so franchises. In the logical file each franchise occurs exactly once, while in the relation TEAMS, each franchise occurs in a number of tuples equal to the number of years of its existence. Similarly, in the logical file, each city in which the franchise has resided appears once, while in relation TEAMS, each city appears in one tuple for each year the franchise was located in that city.

The basic operations by which a data base is modified are the insert, delete and modify instructions, essentially as introduced in Chapter 2. If the relational data model is used to describe the data base, it is natural for these operations to apply to tuples. We shall describe the implementation of these three operations on the assumption that relations are represented by files in which tuples and records are in one-to-one correspondence and the file is organized by one of the methods of Chapter 2. However, the reader should be able to supply the details of implementation if logical files of variable-length records are used. If yet another implementation is used, it is the implementor's responsibility to see that insert, delete and modify can be executed without undue difficulty.

1. *Insert.* For this operation, we are given the tuple to insert and the relation into which it is to be inserted. Select from the tuple the values of those attributes that form a key for the file. With these values, we have only to follow the directions given in Chapter 2 for the appropriate file organization, to insert the record made from the tuple. Conversion of a tuple to a record is not hard. As a tuple is a logical data item it may, for example, have for an attribute value a character string that is too short for the corresponding field of the record, which holds character strings of fixed length. Therefore, we must pad the attribute value with blanks to make a field value. Similarly, the value of an attribute could be an integer while the corresponding field takes real values; again a straightforward conversion is necessary.

2. *Delete.* Suppose we are given a relation and values for at least those attributes that form a key for that relation and its underlying file. We may therefore apply the deletion procedure for the appropriate organization directly to the underlying file. Many systems allow deletion of a set of tuples even if the key is not given. In this case we must scan the entire file no matter which of the standard organizations are used.

3. *Modify.* Here we are given a relation, values for the key attributes and new values for those attributes that must change. Again the translation from attribute values to field values is straightforward, and we may apply the appropriate modification procedure to the file as described in Chapter 2. If we are not given values for attributes in the key, we are again forced to scan the entire file.

Interrogation Of a Relational Data Base

The lookup operation on a relation also presents no surprises. However, data manipulation languages using the relational model generally have a rich set of commands, from which we can build a variety of "queries" that obtain data from one or more relations. Some examples of how queries are expressed in existing relational data base management systems (DBMS) will be given in the next chapter. However, let us here give some idea of typical queries and the problems they entail.

Example 3.4: Consider the relational data base that was described in Figure 4. One type of query asks for the values of certain attributes in those tuples of a relation that satisfy a particular condition. For example, we might

(Continued on In Depth/8)

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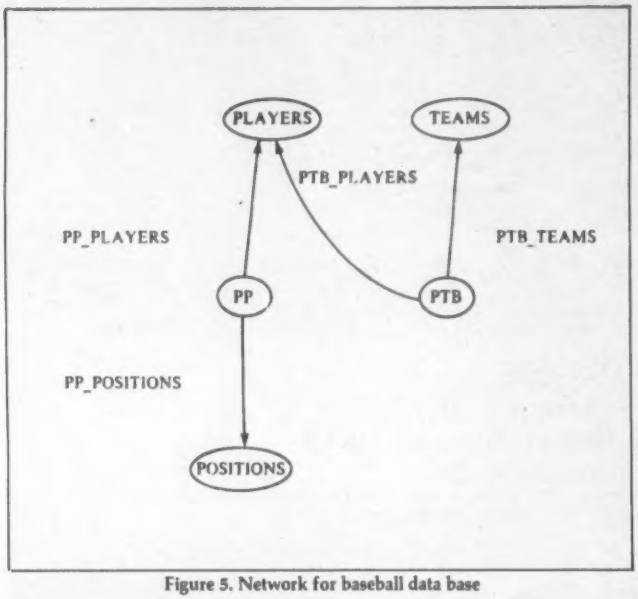

Figure 5. Network for baseball data base

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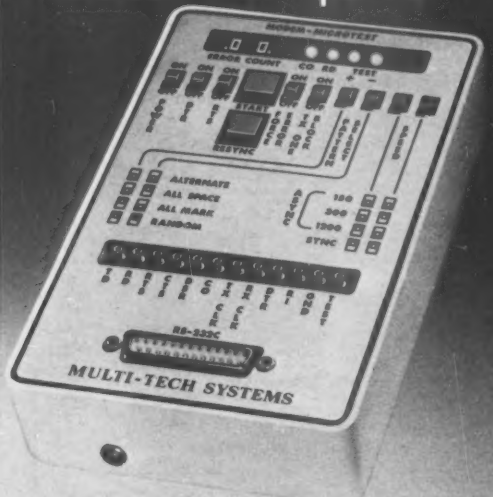

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(Continued from In Depth/6)

ask for the name and franchise of all those players that batted .300 or over for at least one season while playing for that franchise. To implement this query we must scan the tuples of the SEASON relation, or strictly speaking, we scan the records of the file representing the relation. Each time we encounter a tuple for which PCT is at least .300, we collect the NAME and FRANCHISE values from that tuple.

To avoid examining the record for every tuple, it would be useful to have a secondary index on attribute PCT for the file. We would also find it convenient if the secondary index, which is a logical file of variable-length records of the form PCT(RECORD)*, were sorted on its key, PCT. However, none of these conveniences are essential; they merely speed up processing.

Once we have collected all the desired pairs (NAME, FRANCHISE), we could print them out as is. Strictly speaking, we have produced a relation with relation scheme (NAME, FRANCHISE), and the mathematical notion of a relation does not permit duplicate tuples. Therefore, we should, in principle, remove duplicate tuples, which will occur whenever a player batted .300 or more for two or more seasons for the same franchise. We could, for example, sort the relation by NAME and, within each group of tuples with the same NAME, sort by FRANCHISE. Then duplicate tuples will be adjacent in the order and can be removed easily. However, many relational DBMS will not eliminate duplicate tuples unless specifically directed to do so by the user.

As a further example, let us again consider the data base of Figure 4, and suppose we ask for the franchise for which Ty Cobb played in 1911. Since NAME and YEAR form a key for the SEASON relation, it is straightforward to execute a lookup on the file representing SEASON, finding the desired record, and determining that the FRANCHISE attribute for the record is "Tigers."

Now suppose that instead of asking for Cobb's franchise in 1911, we asked for the city in which he played that year. This information is not available from the SEASON relation. However, we can obtain the answer by proceeding as above to determine that Cobb played for the Tigers in 1911, then using ("Tigers," 1911) as a key value in the TEAMS relation to discover that the Tigers franchise was in Detroit in 1911.

The process of following logically connected data from relation to relation in order to obtain desired information is called *navigation*. We saw our first example of navigation in the last part of Example 3.4. In the next chapter, we shall consider some of the ways that relational data manipulation languages allow the user to navigate, that is, to connect information from two or more relations. In general, navigation in a broader sense, meaning to follow connections between several parts of that data base, is part of any data manipulation language, regardless of the model.

3.2 The Network Data Model

Roughly, the network data model is the entity-relationship model with all relationships restricted to be binary, many-one relationships. (Some rather general definitions of the network model allow many-many relationships, requiring only that they be binary.) This restriction allows us to use a simple directed graph model for data. It also makes implementation of relationships simpler, as we shall see when we discuss a concrete implementation of the network model in Chapter 7.

There is no consistent terminology for the network model, so we shall adopt our own, trying to be consistent with terms we have used, or shall use, for files and for the other data models. In place of entity sets, we shall talk about *logical record types*, in the network model. A logical record type is essentially a relation, that is, a named set of tuples. However, as in the entity-relationship model, we admit the possibility that two identical records of the same logical record type exist; these records are distinguished only by their relationship to records of another logical type.

In the network model, we use the term *logical record* in place of "tuple," and *logical record format* in place of "relation scheme." (We drop the word "logical" from "logical record," or "logical record type/format" whenever there is no confusion with the terms for files.) We call the component names in a logical record format *fields*.

Let us at the outset justify our decision to change terminology between the relational and the network model by reminding the reader that in the network model, logical record types are used principally to represent what we have called entity sets, while in the relational model, we use relations to represent both entities and relationships. While we cannot rule out bizarre uses of any data model, we feel it would do violence to the intuitive purposes of relations and logical record types if we tried to merge the two concepts.

Instead of "binary many-one relationships" we talk about *links*. We draw a directed graph, called a *network*, which is really a simplified entity-relationship diagram, to represent record types and their links. Nodes correspond to record types. If there is a link between two record types T_1 and T_2, and the link is many-one from T_1 to T_2, then we draw an arc from the node for T_1 to that for T_2, and we say the link is from T_1 to T_2. Nodes and arcs are labeled by the names of their record types and links.

(Some works on the subject draw the arc in the opposite direction. However, we chose this direction to be consistent with the notion of functional dependency discussed in Chapter 5. Our point of view is that arrows mean "determines uniquely." Thus, as each record of type T_1 is linked to at most one

record of type T_2, we draw the arrow into T_2).

Entity-Relationship Diagrams In the Network Model

As we have stated, entity sets are represented directly by logical record types. The attributes of an entity set are fields of the logical record format. In the case that an entity is determined uniquely only through a relationship with another entity, we shall add another field that is a serial number for the entity set, uniquely identifying each entity. This serial number might be a field only on the logical level; in the implementation we could use the location of the record representing the entity as its "serial number."

Among relationships, only those that are binary and many-one (or one-one as a special case) are representable directly by links. However, we can use the following trick to represent arbitrary relationships. Say we have a relationship R among entity sets $E_1, E_2, \ldots, E_k$. We create a new logical record type T representing k-tuples $(e_1, e_2, \ldots, e_k)$ of entities that stand in the relationship R.

The format for this record type might consist of a single field that is a serial number identifying logical records of that type, although there are many situations where it is convenient to add other information-carrying fields in the format for the new record type T. We then create links $L_1, L_2, \ldots, L_k$. Link L_i is from record type T to the record type for T_i for entity set E_i. The intention is that the record of type T for $(e_1, e_2, \ldots, e_k)$ is linked to the record of type T_i for e_i, so each link is many-one.

Example 3.5: Let us represent in the network model the information about baseball players and teams shown in the entity-relationship diagram of Figure 3. First we shall have logical record types PLAYERS, TEAMS and POSITIONS. The fields of their logical record formats are the same as the attributes of the relations of the same name, from Example 3.3. There is no logical record type for entity set BA, for reasons we shall discuss in connection with the relationship SEASON.

Consider now the many-many relationship PLAYS, between PLAYERS and POSITIONS. To represent PLAYS we need a new record type, which we call PP. The record format for PP consists of a serial number PPID. There are two links, PP_PLAYERS from PP to PLAYERS, and PP_POSITIONS, from PP to POSITIONS.

We also need to represent the ternary relationship SEASON among entity sets PLAYERS, TEAMS and BA. We create a new logical record type PTB with a serial number field named PTBID. We create links PTB_PLAYERS, from PTB to PLAYERS, and PTB_TEAMS, from PTB to TEAMS.

We could also create a link from PTB to BA, but we do not need to do so, because the SEASON relationship uniquely determines a batting average, given a player and team. Thus we could include the PCT attribute in the PTB record format, allowing us to avoid the existence of a BA record type and a link from PTB to BA. Notice that we could, in principle, include the attributes of PLAYERS and TEAMS in the PTB format, as well, but to do so would waste a considerable amount of space; the attribute values for each team would be repeated once for each player on the team, and the attributes of a player would be repeated once for each team he was on.

The logical record types we have defined are listed below. As for relation schemes, we use the notation $R(A_1, A_2, \ldots, A_k)$ for record type R with format $A_1, A_2, \ldots, A_k$.

```
PLAYERS (NAME, HOME, BDATE)
TEAMS (FRANCHISE, CITY, YEAR)
POSITIONS (POSNAME, POSNUMBER)
PP (PPID)
PTB (BTBID, PCT)
```

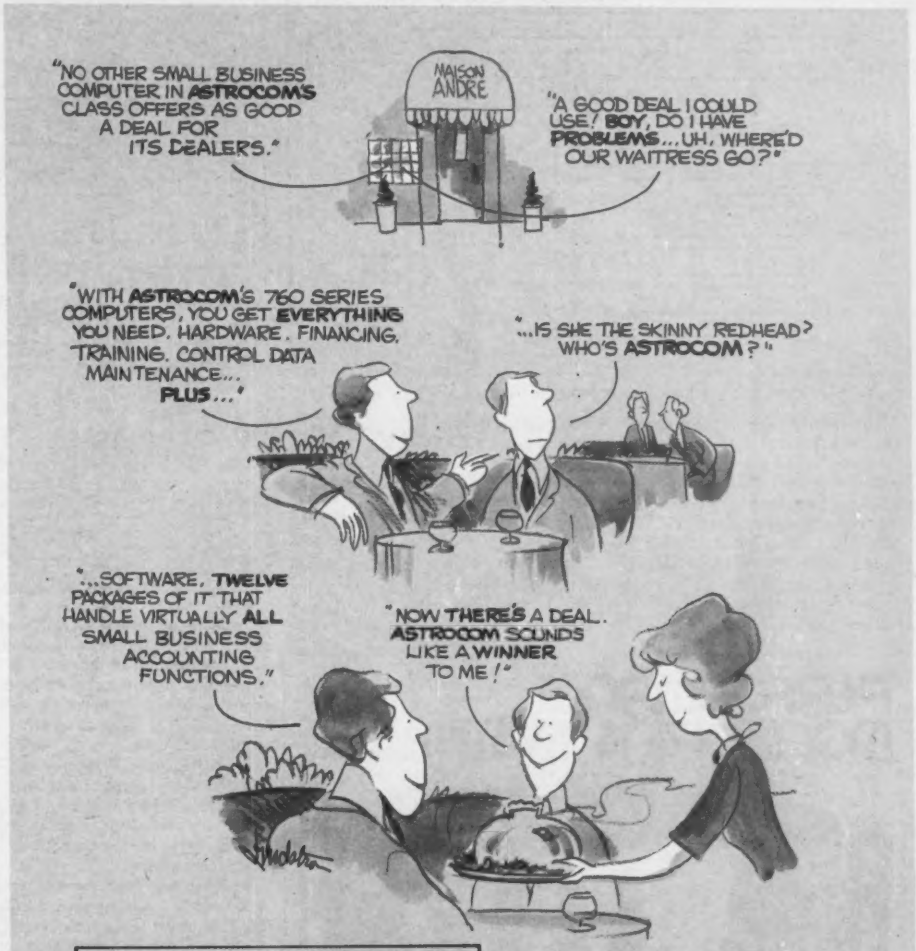
The links are:

```
PP_PLAYERS from PP to PLAYERS
PP_POSITIONS from PP to POSITIONS
PTB_PLAYERS from PTB to PLAYERS
PTB_TEAMS from PTB to TEAMS
```

The network is shown in Figure 5.

In Figure 6 (see In Depth/10) we show some sample logical records of each type and the occurrences of links among these records. There may, of course, be other link occurrences involving some of the records shown.

(Continued on In Depth/10)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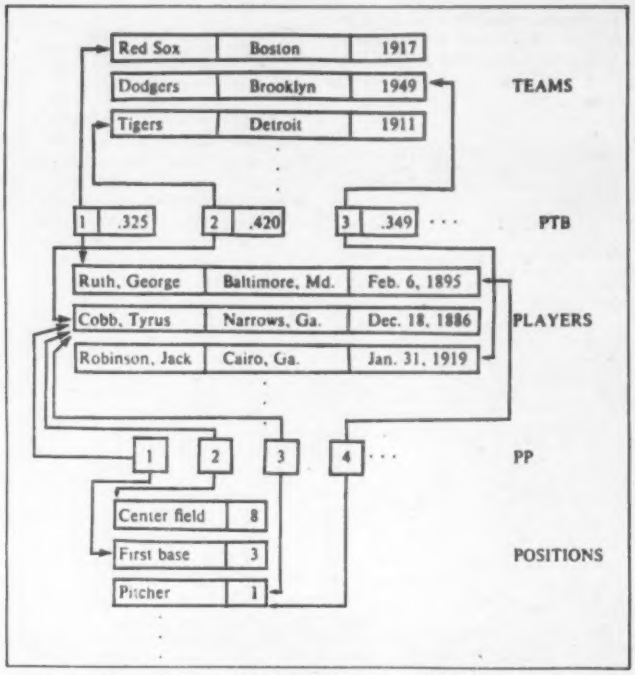

Figure 6. Some logical records in the baseball data base

(Continued from In Depth/9)

We can represent the logical records of a given record type by a file in the obvious manner, with one field of each record for each field of the logical record. We may dispense with fields for artificially created serial number attributes as in PP or PTB of Example 3.5 by using the location of the records to identify records uniquely. As we shall see, even if a logical record format consists only of the serial number attribute, its records need not disappear entirely, and the presence of those records surely will influence the organization of the data base, no matter what representation we choose for the network.

Suppose we have a link from record type T_1 to record type T_2. Since the link is many-one from T_1 to T_2, we could represent it by variable length records of the format $T_2(T_1)^*$. That is, after each record of type T_2, list all the associated records of type T_1. The variable length records can then be represented in one of the ways discussed in Section 2.6. If there is another link from record type T_2 to T_3, we can list the occurrences of T_3 records with corresponding T_2 records, using a variable length record format like $T_2(T_1)^*(T_3)^*$. Again, the methodology of Section 2.6 can be used to implement such variable length records.

However, suppose there is another link from T_1 to some record type T_4. We cannot list T_1 records after T_2 records and also list them after T_4 records, or at least, it would hardly be efficient or convenient to do so. We therefore need another way of representing links, one that does not force records of one type to be adjacent to records of another type. In this organization, called a *multilist*, each record has one pointer for each link in which it is involved, although there is the option of eliminating the pointer for one link and representing that link by variable length records as discussed above.

Suppose we have a link L from T_1 to T_2. For each record R of type T_2 we create a circular chain from R, to all the records $R_1, R_2, \ldots, R_k$ of type T_1 linked to R by L, and then back to R. The pointers for link L in records of types T_1 and T_2 are used for this purpose. We show an example chain in Figure 7. Note how we can follow the chain from R to visit each of $R_1, R_2, \ldots, R_k$ and, if records of type T_1 are identifiable in some way (e.g., each record begins with a few bits indicating its record type, or the record address determines the type) we can go from any of $R_1, R_2, \ldots, R_k$ to R.

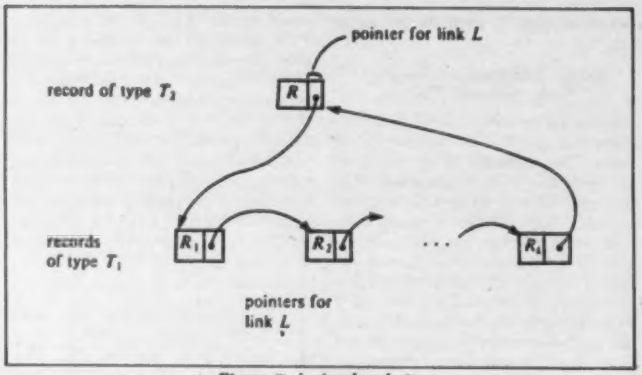

Figure 7. A circular chain

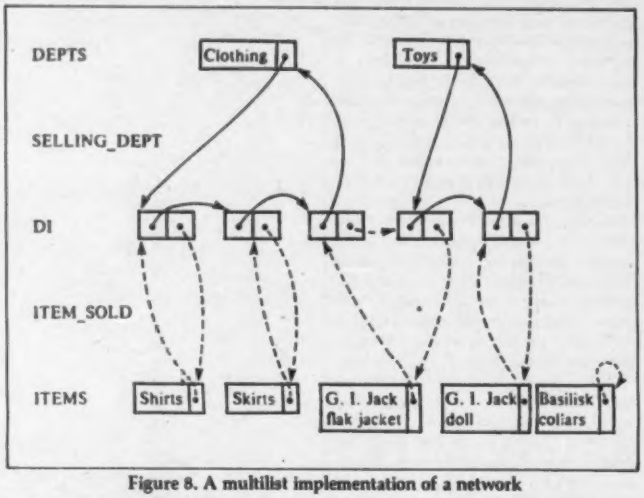

Figure 8. A multilist implementation of a network

It is important to remember that in a multilist organization, each record has as many pointers as its record type has links. As the pointers are fields in the records, and therefore appear in fixed positions, we can follow the chain for a particular link without fear of accidentally following some other link. Also remember that since links are many-one, each circular chain has exactly one record of one type and zero or more records of the second type.

Notice that if we tried to represent many-many relationships by multilists we would face severe problems, since each record could be on many chains for the same relationship. We would not know in advance how many pointers were needed in a record for each link, and we would have trouble determining which link was for which chain. The problem is not conveniently solved, which explains why the network model emphasizes many-one

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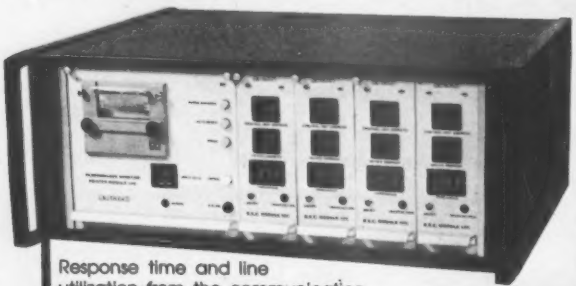

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links.

Example 3.6: Let us take a simple example of a many-many relationship implemented by two many-one links and a dummy record type. The two entity sets involved in the relationship are DEPTS (of a department store) and ITEMS, and the relationship is SELLS. As most departments sell more than one item, and an item could be sold by more than one department, SELLS is a many-many relationship. To represent SELLS in the network model, we need the intermediate record type DI and two links:

1. SELLING_DEPT from DI to DEPTS, and
2. ITEM_SOLD from DI to ITEMS.

In Figure 8 we see a portion of the physical data base, where links are represented by multilists. We see two departments, Clothing and Toys, and five items:

1. Shirts, sold by the Clothing Department.
2. Skirts, sold by the Clothing Department.
3. "G.I. Jack" dolls, sold by the Toy Department.
4. G.I. Jack Flak Jackets, sold by both the Toy and Clothing Departments.
5. Basilisk collars, sold by no department, due to insufficient demand.

We see in Figure 8 two pointers in each DI record; the first is for link SELLING_DEPT and the second for ITEM_SOLD. The DEPTS records show only the pointer for SELLING DEPT; there could be other links involving DEPTS. Similarly, we show in ITEMS records only the pointer for the ITEM_SOLD link. SELLING DEPT pointers are shown with solid lines and ITEM_SOLD pointers are dashed lines.

Operations on Networks

As in the relational model, the basic commands to change the data base are insertions, deletions and modifications. But while in the relational model we had only to consider these operations on relations, for the network model we must consider the operations on both logical record types and on links. The principles are the same for all three operations, in that each operation is implemented by the corresponding operation on a file, so let us discuss only insertion.

To insert a logical record into a logical record type, we create a physical record from the logical record just as we converted a tuple to a record in the relational model. We then insert the record into the file representing the logical record type, using the appropriate technique from Chapter 2, depending on the file organization.

Suppose now that we have a link L from record type T_1 to record type T_2, and we wish to add to this link the fact that record R_1 of type T_1 is associated with record R_2 of type T_2. First, if necessary, we insert R_1 and R_2 into the files for T_1 and T_2, respectively. If link L is represented by variable length records of the format $T_2(T_1)^*$, we look up the record for R_2 in the file representing the variable length records and insert R_1 onto the list of associated records of type T_1, using an algorithm from Section 2.6; the exact algorithm depends on how variable length records are represented.

If link L is represented by a multilist organization, we again look up the record for R_2 in the file for T_2. We also look up the record for R_1 in the file for T_1. We then link the latter onto the chain of the former, using elementary list processing operations on the fields of R_1 and R_2 that hold the pointers associated with L.

Note that for both the above representations of links we assume that R_1 was not previously linked to any record of type T_2. If that assumption is false we must first look up R_1 in the file for T_1. If the multilist strategy is used, it is a simple matter to remove R_1 from whatever chain for L on which R_1

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appears. If the variable length record approach is used to represent L, matters are not so simple. There may be no convenient way to get from R_1 to the record R_2 of type T_2 with which it is currently linked.

Fortunately, an easy fixup for each of the representations of variable length records exists to allow us to get from R_1 to R_2. For example, if the records of type T_2 have a pointer to a chain of blocks with associated records of type T_1, we can end the chain with a pointer back to the type T_2 record to which the chain belongs.

Queries on Networks

The simplest queries to answer about a data base represented by the network model involve only attributes of one record type. For example, referring to the data base of Example 3.5, we could answer: "What is Ruth's birthday?" by doing a lookup on the file for record type PLAYERS, with value "Ruth, George" for the attribute NAME. Since NAME is the key for PLAYERS, this lookup can be done efficiently. If the query gives us the values of attributes that do not form a key, then we need secondary indices for the file on at least some of the given attributes, or we must search the entire file.

Next, in order of difficulty, come queries that involve following a link. We may be given a key value for a record of type T_1 and be asked to find a record or records of type T_2 to which it is linked by link L from T_1 to T_2. Referring again to Example 3.5, we may be asked "Did Robinson ever bat over .340?" We find the PLAYERS record for Robinson, which gives us access to the list of PTB records for Robinson, by following the PTB PLAYERS link. We can scan these records for one with a PCT value above .340 and find one with .342.

It is also possible that we are given a key value for a record R of type T_1 and are asked to find the unique record of type T_2 linked to it by link L from T_1 to T_2. If L is represented in multilist fashion, this task is easy; we follow the chain for L on which R appears, until we come to the record of type T_2 on the chain. If L is represented by variable length records, we must have available a pointer that gets us from R to the beginning of the variable length record of which it is part, as discussed in connection with the deletion of links. If the pointer exists, we have no problem; if not, we shall have to scan the entire file of records of type T_2 to discover which one has R associated with it.

The hardest kind of query to handle is one that involves following two or more links. For example, suppose we ask: "What center fielders batted over .400?" We begin by finding the POSITIONS record for "Center field," which is easy, since POSNAME is a key for that record type. Next we examine each of the PP records linked to "Center field" by the PP_POSITIONS link. We follow the PP_PLAYERS link to obtain a unique PLAYERS record for each PP record. Lastly, from each PLAYERS record found, we examine the PTB records linked to it by the PTB PLAYERS link, and if one or more PTB records for that player have a PCT value above .400, we print the name of the player.

3.3 The Hierarchical Data Model

A *hierarchy* is simply a network that is a *forest* (collection of trees) in which all links point in the direction from child to parent. We shall continue to use network terminology "logical record type," and so on, when we speak of hierarchies. One additional concept that is useful when dealing with hierarchies is the *virtual* logical record type, which is a pointer to a record of a given logical type. Virtual record types are needed in situations where intuitively we would like to place a record type in two or more trees of a hier-

(Continued on In Depth/14)

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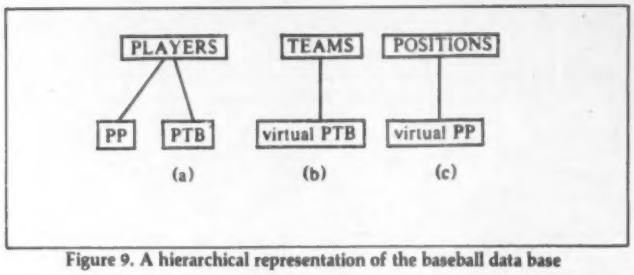

Figure 9. A hierarchical representation of the baseball data base

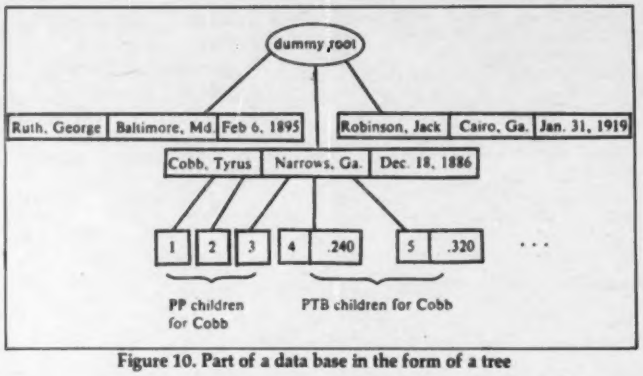

Figure 10. Part of a data base in the form of a tree

(Continued from In Depth/13)

archy, or even in several places in one tree. We do not wish to place two copies of a record in two positions in the data base; to do so wastes space and invites the possibility that we might change one copy without changing the other. Therefore, each logical record type appears in one place in the hierarchy, and other places where we would like that record type are given virtual records instead.

Using virtual types, we can convert any network to a hierarchy. Begin with any logical record type R, which becomes the root of the first tree. If possible, choose R to have no links leaving. The children of record type R are any types that have links entering R. Their children are found by following links backward from them, from head to tail, and so on. However, if we ever encounter a type we have already placed in the hierarchy, we create a virtual record type, put this virtual record type in the hierarchy instead of the logical type encountered, and do not add any children of the virtual type. When we can add no more children to the tree under construction, look for a logical record type not already placed in the hierarchy. If we find none, we are done. Otherwise, repeat the tree construction process with one of the previously unplaced logical record types.

Example 3.7: Let us convert the network of Figure 5 to a hierarchy. We might begin with PLAYERS, which has arcs from PP and PTB entering, but no arcs leaving. The latter two record types have no arcs entering, so we are done with the first tree; it has PLAYERS as root and PP and PTB as children. Our second tree might start with TEAMS. There is one entering arc, from PTB, which we have already placed in the hierarchy. Thus we give TEAMS a virtual record type "pointer to PTB" as child and go on to the third tree, which consists of root POSITIONS with virtual PP as child.

The entire hierarchy is shown in Figure 9. Let us observe now that this hierarchy is a poor way to represent the baseball data base, because the sorts of queries about this data base that are phrased easily in hierarchy-based data manipulation languages do not include some very natural queries. We shall justify this remark about queries and give a better hierarchical representation shortly.

An instance of the data base described by a tree of logical record types may be viewed as a forest. For each logical record type in the hierarchy, the data base will have zero or more nodes, each representing a record of that type. It is sometimes useful to draw each tree in the data base with a dummy root, whose children are the record occurrences of the root record type. For example, part of the data base tree for scheme (a) of Figure 9 is shown in Figure 10. The numbers 1 through 5 are serial numbers, which identify PP and PTB records. The serial numbers disappear in an implementation.

Direct Representation Of Many-Many Relationships

Sometimes, hierarchies designed directly from a network can lead to awkwardness when we try to answer queries. Consider the hierarchy of Figure 9, and suppose we wanted to know what positions Cobb played. We would start at the root of Figure 10 and search for the PLAYER record for Cobb. We might be aided in our search

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by an appropriate organization of the file of PLAYER records, so suppose we find the Cobb record easily. We scan those children of that record that are of PP type. Say we examine the record with serial number 1. We must now go to the data base corresponding to tree (c) of Figure 9 and examine each POSITION record. For each such record, we look at its children which are virtual PP records, that is, pointers to PP records in the data base for tree (a). If we find a virtual PP record for a position that points to the PP record with serial number 1, then we know Cobb played that position.

We might ask why it is much easier to answer this query in the network of Figure 5 than in the hierarchy of Figure 9. The reason is that links in a network are essentially two-way connectors, and in Figure 5 we are able to go directly from a PP record to a POSITIONS record. However, the algorithm above for converting a network to a hierarchy broke the link from PP to POSITIONS, although the link from POSITIONS to PP exists due to the pointers in the virtual PP records. There is an inherent tendency for links to get broken when we go from a network to a hierarchy, although they can be maintained by introducing extra pointer fields into the logical record types of the hierarchy.

Another problem with a poorly designed hierarchy is that while we can navigate wholly within a data base built along the lines of the network data model, in a hierarchy we must sometimes jump from tree to tree. This can only be accomplished by reading a value from the data base into the workspace of the application program (e.g., the serial number 1 in Example 3.7) and using that value to access information in another tree.

For these reasons, one must often exercise care in designing a hierarchy, so values will be available where needed. One useful idea is the following. Suppose we have entity sets E_1 and E_2 with a many-many relationship R between them. We can represent R in a hierarchy by selecting either E_1 or E_2, say E_1, to be the root of a tree. We give the root a child logical record type T consisting of:

1. A serial number, to identify records, and
2. Attributes forming a key for E_2.

As in networks, the serial number might not appear in the implementation, being replaced, in essence, by the address of the record. We do not wish to place all attributes of E_2 in the format for record type T, because we would then have the task of making sure that several E_2 records representing the same entity had the same information. Instead, we create another logical record type with all the attributes of E_2; this record type will be placed somewhere in the hierarchy — at the root of its own tree if no more convenient place can be found.

In some applications it is only necessary to find E_2 entities associated with a given E_1 entity, and if so, the above arrangement is ideal. However, in other cases it may also be essential that we be able to find the E_1's associated with an E_2 conveniently. If this is the case, we can include, as a child of the E_2 record type, a new record type consisting of the key fields of E_1.

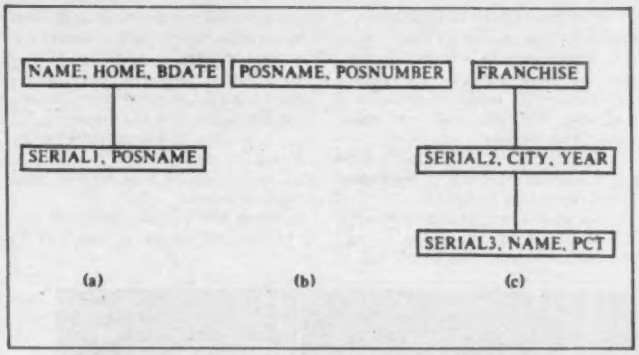

Figure 11. An improved hierarchy for the baseball data base

Another possibility is to replace the record types consisting of the keys for E_1 and/or E_2 pointers to E_1 or E_2 records, respectively. This arrangement pins the records pointed to, but it allows direct access to those records. In comparison, using key values to indicate records requires us to search for the desired record. The reader is referred to Chapter 8 for a detailed example of how a major hierarchical DBMS facilitates the implementation and use of many-many relationships in practice.

Example 3.8: Let us redesign the hierarchy for the baseball data base. Remember, the original definition of the data base scheme is the entity-relationship diagram of Figure 3. To express the PLAYS relationship we shall have a tree whose root is the logical record type (NAME, HOME, BDATE) representing PLAYERS. The root has a child logical record type (SERIAL1, POSNAME) representing the names of the positions each player plays. The attribute SERIAL1 is a serial number used to identify records, and it will probably disappear in an implementation, being represented by the location of the record.

To represent the association between position names and numbers there will be a second tree with only a root logical record type: (POSNAME, POSNUMBER).

We could use the attributes of entity set TEAMS as the root of a third tree, but since we are designing a hierarchy, we may as well take advantage of the fact that there is a hierarchical structure to the set of teams. We choose as root for the third tree a logical record type consisting only of FRANCHISE. A franchise can be viewed as composed of teams, one for each year, so the root of the third tree has one child, which is the logical record type (SERIAL2, CITY, YEAR).

In the data base itself, each record of the above type represents a team, which is determined by the value of YEAR and the value of FRANCHISE in the parent of the record. Again, SERIAL2 is a dummy serial number used to distinguish records of this type, since there may be two franchises in a given city in a given year.

The above logical record type has a child logical record type representing the players on a team and the batting average of that player for that year; its logical record format is: (SERIAL3, NAME, PCT).

We expect SERIAL3, like the other serial numbers, to disappear in an implementation, and it is present in the conceptual data base scheme to prevent us from identifying records with the same NAME and PCT if they represent the batting average of a player for two different seasons.

The entire hierarchy is shown in Figure 11.

In the hierarchy of Figure 11, we can answer a query such as "What positions did Cobb play?" by finding the Cobb record in the file for the root record type in a tree (a) and examining its children, each of which has the name of a position Cobb played. We could even find the numbers of the positions Cobb played by proceeding as above, then looking in tree (b) for the record for each position, to get the position's number.

Implementation Of Hierarchical Data Bases

The ideas used in the implementation of a network data base carry over to the hierarchical model directly, since hierarchies are special cases of net-

(Continued on In Depth/16)

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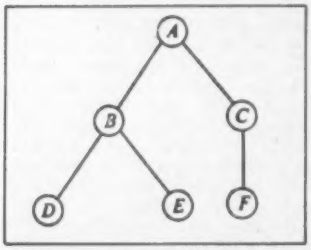

Figure 12. A tree

(Continued from In Depth/15)

works. Representation by files of variable length records is especially suitable for hierarchies. To construct a variable length record format for a tree, use the following two rules, working up the tree:

1. The format for a leaf is $(\alpha)^*$, where α is the list of attributes in the logical record format for this leaf.
2. If a node has k children with variable length record formats $\alpha_1\alpha_2, \ldots, \alpha_k$, and the list of attributes in the logical record format for this node is B, then the variable length record format for the node is $(\beta\alpha_1\alpha_2 \ldots \alpha_k)^*$.

In following the above rules, we construct one file of variable length records for each tree in the hierarchy. Of course, each such file must be implemented, as discussed in Section 2.6, such as by one or more files of fixed length records.

Example 3.9: The variable length record format for the tree of Figure 11 (c) is:

(FRANCHISE(SERIAL2 CITY YEAR (SERIAL3 NAME PCT)*)*)*

and for Figure 9 (a) it is:

(NAME HOME BDATE(SERIAL1)* (SERIAL2 PCT)*)*

Another possible implementation of a hierarchy is to list the records of each tree in preorder as we suggested in Section 2.6 for fields of a variable length record format. A preorder traversal, or listing, of a tree is defined recursively, as follows:

1. List the root.
2. For each child c of the root, from the left do
   list the subtree with root c, in preorder.

Example 3.10: Suppose we have the tree of Figure 12. To list it in preorder, we list *A*, the root, and then list the tree of *B*, *D* and *E*, in preorder. To do so, we list *B* and then the tree consisting of *D* alone, then the tree of *E* alone. Thus the first four nodes in preorder are *ABDE*. To complete the preorder listing we list the tree whose root is *C*, which gives *ABDECF* as the complete preorder.

When we list in preorder a tree of records in a data base, we must identify each record by some bits at the beginning that indicate its logical record type. This is necessary so we know how to find and interpret the values of fields in the record. It is also convenient to make available in each block over which the records are spread, information telling where in the block each begins, since we do not know *a priori* what type each record is or how long it is. As we shall discuss in Section 8.4, it is also useful to thread the list with pointers of various sorts to provide easy access to siblings.

Example 3.11: We may view Figure 12 as a conceptual schema described using the hierarchical model, where *A*, *B*, . . . represent logical record types. In Figure 13 is a possible data base represented by the schema of Figure 12. We could list each of the records represented by a node in Figure 13 in preorder, over as many blocks as needed, as follows: $a_1b_1d_1d_2d_3e_1b_2d_4c_1f_1f_2c_2f_3a_2b_3d_5e_2c_3f_4f_5f_6c_4f_7$.

Notice that the above string is an instance of the variable length record format $(A(B(D)^*(E)^*)^*(C(F)^*)^*)^*$ constructed from Figure 12.

3.4 Comparison of the Models

To evaluate the three models discussed in this chapter we must first state the criteria by which they should be judged. We see two concerns:

1. *Ease of use.* Especially in small data bases, on the order of thousands or tens of thousands of records, the principal cost may be the time spent by the programmer writing applications programs and by the user posing queries. We want a model that makes accurate programming and the phrasing of queries easy.
2. *Efficiency of implementation.* When data bases are large, the cost of storage space and computer time dominate the total cost of implementing a data base. We need a data model in which it is easy for the DBMS to translate a specification of the conceptual

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THE THREE GREAT DATA MODELS

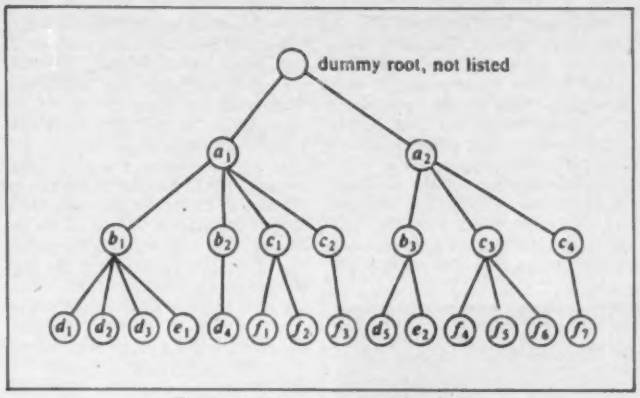


Figure 13. A tree-structured data base

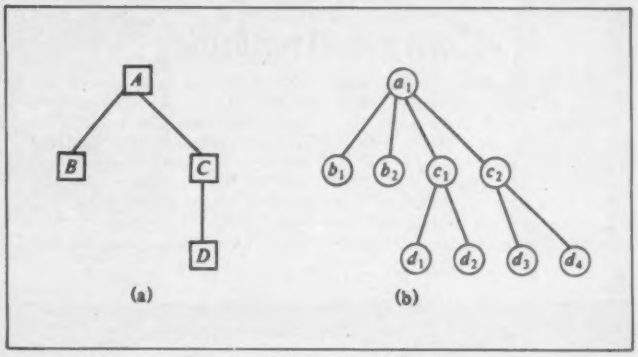


Figure 14. A hierarchy and data base

A	B
a_1	b_1
a_1	b_2

A	C
a_1	c_1
a_1	c_2

C	D
c_1	d_1
c_1	d_2
c_2	d_3
c_2	d_4

Figure 15. Relations

scheme and the conceptual-to-physical mapping into an implementation that is space efficient and in which queries can be answered efficiently.

By the criterion of easy use, there is no doubt that the relational model is superior. It provides only one construct that the programmer or user must understand. Moreover, as we shall see, there are rich, high-level languages for expressing queries on data represented by the relational model. These languages make systems based on the relational model available to persons whose programming skill is not great.

In comparison, the network model requires our understanding of both record types and links, and their interrelationships. The implementation of many-many relationships and relationships on three or more entity sets is not straightforward, although with practice one gets used to the technique, discussed in Section 3.2, of introducing dummy record types. Similarly, the hierarchical model requires understanding the use of pointers (virtual record types) and has the same problems as the network model regarding the representation of relationships that are more complex than many-one relationships between two entity sets.

When we consider the potential for efficient implementation, the network and hierarchical models score high marks. We saw in Section 3.2 how implementations of variable length records can facilitate the task of following links. We also mentioned that data structures such as the multilist and the pointer-based implementation of variable length records do not generalize readily to many-many mappings.

Since relations can, and often do, represent many-many mappings, we see that efficient implementation can be more difficult for relations than for networks or hierarchies. Fortunately, some specialized data structures can be used to implement relations, as well. In Section 4.5 we shall discuss how the multilist and other ideas have been adapted to relations in one existing system.

Efficient utilization of space sometimes can be easier using hierarchies (or networks in the form of a hierarchy) than relations. As a case in point, consider the hierarchy of Figure 14(a) and an example data base in Figure 14(b). If we wished to represent the same structure by relations, we would probably choose one relation with attributes A and B, another with attributes A and C and a third with attributes C and D. The corresponding relations are shown in Figure 15. Observe how a_1, c_1 and c_2 are each repeated several times, resulting in a waste of space, compared with Figure 14(b).

The above effect would not be important if it were not that data frequently forms a natural hierarchy. While we are free to implement relations by a hierarchical structure such as Figure 14(b), it is not always clear how to do so. Consider, for example, what the hierarchy corresponding to Figure 15 would look like if C were chosen as the root of the conceptual scheme, rather than A.

Language Level

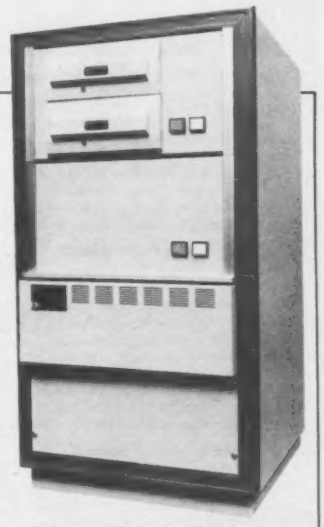
The level of the data manipulation language can affect profoundly the ease with which a DBMS can be used, just as it is easier to program in Fortran than in assembly language, and easier to program in APL than in Fortan. It has been the case that relational DBMS have stressed languages of very high level, while DBMS based on the other models have tended to have languages of lower level. We shall see in Chapter 4 some of the high-level relational languages, while Chapters 7 and 8 exhibit two of the principal low-level languages in which navigation details are expressed in the network and hierarchical models.

One might wonder if there is an inherent reason why these examples are typical. It is hard to argue that there is, although we should point out that the principal general-purpose languages of very high level, such as APL, Snobol, Lisp or SETL, are each based on a single data type (the array, string, list structure and set, respectively), just as the relational model provides but a single data type, the relation. In contrast, lower level languages, like PL/I, have a variety of data types at the programmer's disposal.

In the past, commercial data base sys-

(Continued on In Depth/18)

Ohio Scientific: The leader in Winchester based microcomputers.



Ohio Scientific produced the first Winchester based microcomputer in 1977. Since then, we have shipped more of these systems than the rest of the industry combined. Among them are our C3-B and our C3-C microcomputers.

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The C3-C computer has been designed and engineered to fill the void that existed between floppy disk systems and larger hard disk systems.

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The CPU employs three microprocessors, the 6502, the Z-80 and the 6800. And the processor bus has been designed so new, more powerful micros (like 16 bit CPU's) can be added to the system later on.

There are also 10 open slots in the basic C3-C. The system supports up to 768K bytes of memory, in a multi user configuration.

The C3-B.
74 Megabytes. Under $13,000.
For those who require even more hard disk storage, Ohio Scientific offers another microcomputer in the C3 Series, the C3-B. Its specifications are the same as those of the C3-C. However, the C3-B offers a 74 Megabyte Winchester drive.

For those who do not need hard disk capacity now, but in all probability will need it in the future, Ohio Scientific offers the C3-A. It is like the C3-B and the C3-C in all respects but two. 48K RAM is standard in the C3-A, and it offers 12 open slots. When more storage is needed, the C3-A is easily expandable to either a 23 Megabyte or 74 Megabyte hard disk system. The C3-A is priced at less than $6,000.

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IN DEPTH

Courses Available

Dr. Ullman will teach a three-day course on data base systems in Flint, Mich., on March 24-26 and in San Francisco on June 16-18. Ullman will also teach a three-day course on principles of compiler design in New York City on June 25-27.

The courses are offered by the Computer Science Education Extension, a division of Computer Science Press. These courses plus many others are also available for on-site presentation at industrial or academic facilities. More information on these courses is available from Computer Science Press, Inc., 9125 Fall River Lane, Potomac, Md. 20854. Or telephone 301/299-2040.

(Continued from In Depth/17)

tems have almost uniformly been based on the network or hierarchical model, because the emphasis of such systems has been on the maintenance of large data bases, and these models lend themselves most easily to the necessary efficient implementation.

However, it is felt that the relational model will receive the bulk of attention in the future for two reasons. First, it is becoming clear that the same concepts used to design large data bases apply as well to small and medium-scale data bases, and there are many more small (i.e., thousands of records rather than millions) data bases than large ones. With small data bases, the ease of use inherent in the relational model assumes increased importance.

Second, many of the apparent inefficiencies of the relational model can be eliminated. Chapter 6 discusses some of the optimization techniques for relational data manipulation languages that allow these languages to use time efficiently. Research aimed at producing good physical implementations of relations is also underway. We shall discuss some of the progress connected with IBM's System *R* in Section 4.5, and Section 4.7 discusses Query-by-Example, an existing commercial system suitable for medium size data bases. Just as general-purpose very high level languages such as APL are winning converts as the rather difficult optimization problems associated with these languages gradually are solved, we suspect that the relational model will become more attractive as the optimization problems associated with this model are likewise solved.

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More reasons: print and ribbon systems that won't wear out prematurely and won't cause the problems other line printers do. Which is why the proven rotating-belt print system will last billions of characters. And why the ribbon cartridge will maintain very high print quality for at least 100 million characters.

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Jeffrey D. Ullman is a professor of computer science at Stanford University.

Ullman received his B.S. degree from Columbia University and his Ph.D. from Princeton University in 1966. He worked for three years at Bell Laboratories, Murray Hill, N.J., before returning to Princeton to teach from 1969 to 1979.

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NEW YORK — As any student or school administrator knows, choosing classes or placing students in the right courses is nerve-wracking when a school has only one campus. But the job becomes considerably more difficult when the student body comes from all over the world and the schools can be anywhere in the U.S.

The Institute of International Education (IIE), located opposite the United Nations building here, is the largest and most active educational student exchange in the country. In 1978 alone, it placed more than 6,100 students — most from underdeveloped countries — in some 500 colleges and universities throughout the U.S.

The organization also screened 3,000 applicants and selected 329 to study for a year abroad under the Fulbright Fellowship program.

Funded by U.S. and foreign governments as well as by contributions, the IIE's programs include publications, testing, course development and student counseling. "Basically, we are a nonprofit administrative agency that provides student exchange services for governments and other sponsors," Bruce Barry, IIE's manager of systems and DP, explained.

All of the IIE's administrative chores and files are managed on a Wang Laboratories, Inc. VS minicomputer with 512K bytes of memory and a 288M-byte and two 75M-byte disk drives. The system also includes 14 CRT stations that are scattered throughout the agency's New York office, a 600 line/min printer and a 9-track, 1,600 bit/in. tape drive.

"Originally, we installed a large computer in-house," Barry recalled. "But once some 1,400 programs were written and the system began functioning, no provision had been made for a programming staff to maintain the software. Management could not get reports changed or have new ones implemented."

The IIE, next underwent a number of different arrangements with various service bureaus, ending up with a remote job entry system communicating to a service bureau in Middlebury, Conn.

Institute of International Education staff members coordinate the scholastic activities of thousands of students from around the world.

"This did not work out for several reasons," Bruce recalled. "We process 50,000 transactions a month — most of them at the end of the month. For a few days our terminal was jammed by the flow of information, and during the remaining periods it was used very little.

"Furthermore, it took too long to change programs over the telephone line."

For about three months, Barry examined a number of minicomputer systems offered by Data General Corp., Digital Equipment Corp., Texas Instruments, Inc., IBM, Hewlett-Packard Co. and other vendors. After weighing the benefits of the two systems that seemed most acceptable, the HP 3000-I and the Wang VS, Barry chose the VS because of its virtual storage feature, which the 3000 lacked.

The system's editing capabilities, and interactive debugging facilities also helped sway his decision toward the Wang machine, he said.

The VS machine went on-line after the conversion of 50 programs originally written in Cobol for the service bureau's IBM hardware and after another 150 routines were written for the Wang machine.

"We could never have made that conversion in that period of time on any other piece of equipment. And I'm saying that with 18 years of experience in data processing," Barry remarked.

Aside from its grantee process-

(Continued on Page 68)

DG Offering Dual-Disk Subsystems

WESTBORO, Mass. - Data General Corp. recently introduced a number of Winchester-type dual-disk subsystems that combine up to 25M bytes of fixed media storage with 1.26M bytes of diskette space for its Nova and Eclipse minicomputers and Micronova microcomputer.

Designed to complement DG's disk-only drive which debuted at last year's National Computer Conference, the subsystems incorporate a diskette drive that can be used for high-capacity file transfers or as a backup medium, a spokesman said.

The 25M-byte disk is formatted in sectors of 512K bytes and contains 384 track/surface, divided into two 192-track bands on each of the unit's four surfaces, the spokesman explained. A separate read/write head accesses each band.

A lower capacity, nonremovable 12.5M-byte disk, included on other disk models, is formatted in the same way but has 4 track/cylinder.

The 1.26M-byte diskette uses media with 77 track/side, formatted into 16 sectors of 512 bytes. Data transfer to and from memory is at the rate of 62,500 byte/min.

The subsystems have a self-contained power supply for both the rigid disk and diskette drives and employ the same stepper motor-driven, microprocessor-controlled head seek actuator used in the firm's model 6102 and 6099 disk systems.

Three different subsystems are available. Available for the Nova and Eclipse minicomputers are the Model 6100, containing a 25M-byte fixed disk and 1.26M-byte diskette; the Model 6103, containing a 25M-byte system; and the Model 6098 with a 12.5M-byte disk and a 1.26M-byte diskette. These units cost $10,200, $8,100 and $7,600, respectively.

Subsystems geared for the Micronova include the models 6104, 6105, 6101. These disk packages have the same capacities as their minicomputer counterparts and are priced at $10,200, $8,100 and $7,300, respectively.

Quantity and OEM disk discounts are available, the spokesman stated from DG at 15 Turnpike Road, Westboro, Mass. 01581.

Disk Emulation System Boosts PDP-15 Performance

CRANBURY, N.H. — Dataram Corp. has unveiled a disk emulation system for Digital Equipment Corp.'s older PDP-15 minicomputer that is said to boost the machine's performance and throughput levels to ranges comparable with current CPUs.

Aimed at users who have made a substantial investment in the PDP-15's software and do not want to change hardware, the Bulk Core (BC)-205 functions as a fast-action peripheral and is supplied with a minimum of 256K words of storage.

The unit's capacity can be expanded by adding up to seven more core modules for a maximum storage of 1M words.

The BC-205 is compatible with DEC's RF15/RS09 fixed-head disk system and is software-compatible with the PDP-15's operating system and diagnostics, a Dataram spokesman said. The device provides a write/protect capability for individual 32K-word segments and an off-line tester, he added.

The minimally configured emulation system costs $23,675; while the 512K-word and 1M-word versions sell for $32,975 and $48,095, respectively.

Dataram is located at Princeton-Hightstown Road, Cranbury, N.J.

Present at the Premiere

Emulex Corp. Engineering Vice-President Paul Rutkowski installs the firm's first SC70 large disk controller into a Digital Equipment Corp. PDP-11/70 minicomputer at Rockwell International's Collins General Aviation Division in Costa Mesa, Calif. Designed by Rutkowski, the SC70 is reportedly the first embedded disk controller for the PDP-11/70 and eliminates the need for attaching Massbus or extra boxes outside the mainframe. Watching the installation are Robert Tooley, center, the division's DP manager, and Len Whitacre, president of Alphabyte, the Emulex dealer who handled the sale.

Price Hikes On the Horizon

BERKELEY, Calif. — Effective next month, North Star Computers, Inc. will increase the end-user prices for its Horizon microprocessor-based computer and microdisk products by about 12%.

For example, the price of the Horizon-1-32K Quad capacity computer will go from $2,565 to $2,995.

Prices for the company's OEM system packages will also be raised, by about 10%, a spokesman said.

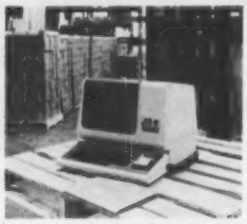
Rising inflation was cited as a reason for the hikes.

Based on PDP-11 or VAX
Turnkey Handles Inventory, Shipping

BEDFORD, Mass. — A minicomputer-based parts inventory and shipping system for equipment manufacturers and service agencies has been announced by Distribution Management, Inc. (DMS).

Based on Digital Equipment Corp.'s PDP-11/23 or VAX-11/780 processor, the DMS-1000/SP is tailored to the user's needs and includes a CRT, a keyboard and such optional equipment as a printer and applications and communications software.

A key feature of the system is its ability to commit inventory at order entry time, minimizing back orders produced by inaccurate inventory levels, a DMS spokesman claimed.



The DMS-1000/SP

Software includes order processing, invoicing and accounts receivables programs as well as inventory management and management information routines.

Additional software is geared to track stock status, quantity in transit, month-to-date and year-to-date orders and shipment and receipt quantities.

The system ranges in cost from $400,000 to $500,000 depending on the customization required. DMS is at 11 DeAngelo Drive, Bedford, Mass. 01730.

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Novas, Eclipses Linked To Digi-Data Tape Units

JESSUP, Md. — Digi-Data Corp. is offering an interface board that allows users to connect any of the firm's reel-to-reel magnetic tape units to Data General Corp. Nova or Eclipse minicomputers.

The board is software-and hardware-compatible with DG equipment and can handle up to two Digi-Data formatters. Each formatter can accommodate up to four transports, allowing the interface to control up to eight tape units in the maximum configuration, a spokesman said.

The board will drive formatters with NRZI, phase-encoded or dual-density modes. The system can support a mix of 7- and 9- track transports.

Data transfers to and from a selected magnetic tape unit are via direct memory access, the spokesman added.

The interface costs $1,500 from Digi-Data at 8580 Dorsey Run Road, Jessup, Md. 20794.

Device Protects Systems From Short Power Surges

SAN JOSE, Calif. — A power surge control device that is said to protect small business computers from potentially destructive voltage transients has been introduced by R&K Enterprises.

Surge Sentry 120 (SS-120) plugs into any standard 120V wall outlet and acts as a buffer between the computer and the electrical current. In operation, the unit detects short-duration voltage surges and reportedly shunts all unwanted or dangerous voltages.

Response 1 Nsec

The SS-120 has a response time of less then 1 nsec and a power dissipation capacity of 600,000, a spokesman said.

The device runs parallel with the user's power line and will not interrupt equipment operation if the unit malfunctions, he added.

The SS-120 costs $89.50. It is available in an OEM version, R&K noted from 643 S. 6 St., San Jose, Calif. 95112.

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Forum Accepted In ICL Federation

ROLLING MEADOWS, Ill. — Forum International, an association serving users of Singer Co., TRW Systems, Inc. and International Computers Ltd. (ICL) systems, has been accepted as a member of the International Federation of ICL Computer Users Associations.

As a member of the federation, Forum becomes the officially recognized North American representative to the worldwide organization.

The ICL federation was formed to coordinate activities among the various user associations, facilitate interassociation communications and direct user problems and opinions to ICL's senior management in the UK.

Floppy Controller For TI's TM990 Has 3740 Format

HOUSTON — Texas Instruments, Inc. has introduced a floppy disk controller for its TM990 series of microcomputer board products that supports up to four double-sided drives and is compatible with IBM's 3740 disk drive format.

The TM990/303 board is CPU-programmable for data encoding formats and number and types of diskette drives. The unit has the ability to interface to single-density drives.

The board's data transfer format and step-per motor rates are both user-programmable, a spokesman stated.

The controller also features write precompensation, 5-in. or 8-in. compatibility, soft-sector compatibility, internal phase acquisition and address mark detection capabilities.

The board costs $845. Additional information on the unit can be obtained from TI at P.O. Box 1433, MS 6404, Houston, Texas 77001.

DC-500 Ready

ANAHEIM, Calif. — Cameo Data Systems, Inc. has started shipping its DC-500s cartridge disk drive controller, designed to operate up to four 10M- or 20M-byte drives for S-100 bus microcomputer systems.

The device costs $1,550 from the firm at 1928 S. Anaheim Blvd., Anaheim, Calif. 92805.

Multitasking Business Micro Handles 48 Users

SALT LAKE CITY, Utah — A multitasking, microcomputer-based business system that can be expanded to support up to 48 users has been introduced by Taurus Research, Inc.

Slated for delivery in March, the T8000 system is built around Zilog, Inc.'s 16-bit Z8000 MPU and has a hard-disk capacity of up to 640M bytes of storage using Winchester-type disks.

The machine's multi-user operating system, termed TOS, can spool to multiple printers, has built-in security features with multiple priority levels and is capable of reporting the status of every job running in the system, a spokesman said.

The operating system also includes an assembler, text editor, utilities programming, a Basic language sort function and an indexed sequential access method file structure.

Available application programs consist of accounts payable, payroll, accounts receivable, statistics, plotting, financial programs and a mailing list system.

A variety of hardware is offered including 10M- 20M- or 40M-byte hard disk drives and a soon-to-be-announced 160M-byte version; a six-port serial I/O board; and an RS-232C-to-bisynchronous converter board. A tape cartridge backup for the T8000 will debut later this year, the spokesman stated.

The entry-level T8000 with two double-sided double-density floppy disk drives and two serial I/O ports costs about $12,500. A mid-level system with eight serial ports, a 40M-byte disk drive and a single floppy disk drive for backup sells for approximately $19,000.

Taurus Research is located at 2880 S. Main St.-220, Salt Lake City, Utah 84115.

Users of TI 99/4 Micro Gain Slew of Peripherals

LUBBOCK, Texas — Texas Instruments, Inc. has pulled the wraps off a variety of peripherals designed to expand the capabilities of its 99/4 microcomputer system.

The first product, a minifloppy disk system, includes a controller and is capable of handling up to three disk drives. Up to 90,000 bytes of information can be stored on each diskette in the system, which can accommodate fixed- and variable-length records as well as sequential and relative files, a spokesman stated.

A solid-state software command module is included with the disk package and supplies a number of disk utilities, including disk and file maintenance commands.

The disk controller costs about $300. The drives are priced at $500 each.

The second offering is a thermal printer that offers 32 pre-defined graphic symbols for printing charts and graphs. Printing is done on 3.5-in. thermally sensitive paper.

The unit prints 32 columns of 5 by 7 dot-matrix characters. It is controlled from Basic and can list programs from the MPU's memory, the spokesman claimed.

The printer sells for about $400.

A telephone coupler modem that allows the 99/4 to communicate with other machines over regular telephone lines is the next peripheral introduced by the Texas firm. The coupler connects to the host computer through one of the unit's RS-232C interface ports and operates in a modulator/-demodulator fashion.

Using the device, users can access consumer data banks on dial-up networks, utilizing the computer as a remote terminal and intermediate storage device, the spokesman said.

A terminal emulator command module provides software support to facilitate data base access routines, he added. The emulator software costs approximately $45 while the coupler is priced at about $225.

Finally, TI unveiled both an RS-232C interface and a speech synthesizer for the 99/4 unit. The interface lets the user connect serially formatted peripheral devices to the microcomputer, converting parallel output to a serial format. The device provides two ports that conform to the EIA standard.

TI's speech synthesizer has a vocabulary of more than 300 words and accepts plug-in modules that increase that capacity by 800 words.

The RS-232C interface costs about $225 and the speech synthesizer carries a price tage of $149.95.

Further information can be obtained through its Consumer Relations Department, P.O. Box 53, Lubbock, Texas 79408.

Edsi Details Offerings In Free Catalog

IRVINE, Calif. — Educational Data Systems, Inc. (Edsi) has released a 16-page product catalog describing its Point 4 minicomputer, Micro-N microprogrammable processor, Interactive Real-Time Information System (Iris) operating system and other offerings.

The publication is free from Edsi at 1682 Langley Ave., Irvine, Calif. 92714.

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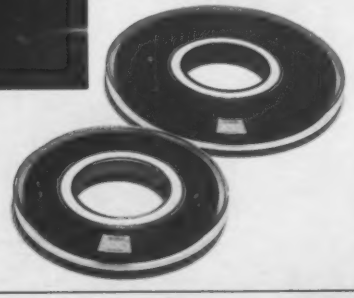

3M

Student Exchange Picks Mini to Do Maxi Job

(Continued from Page 65)

ing activities and records maintenance, the VS system generates approximately 150 reports each day that range in size from two to 40 pages. The reports are reportedly being produced a week earlier than when the institute used the service bureau.

But the greatest savings in time has been realized in check processing. IIE issues 2,500 to 3,000 checks each month to grantees; under emergency conditions, some checks have to be issued immediately. According to Barry, a check that formerly took three to five days to process can now be on its way to a student in one day.

Furthermore, the accounts payable unit and the general accounting unit now have the capability of auditing disbursements directly at a workstation prior to authorizing payments. Such authorization caused significant delay under the previous procedure — which was essentially a document check.

In the administrative area, IIE's Office of Financial Information is using the Wang VS system to monitor administrative budgets — at both the division level and program level — to ensure that spending is consistent with budgets set at the beginning of the fiscal year.

And although the payroll is still processed by a service bureau, the personnel department is expanding its in-house automated file on IIE's 250 employees to include several items previously recorded in manual records, such as life and health insurance contract numbers.

Because of its increased data processing capabilities, IIE last year undertook the entire job of publishing *The Open Door* — a census of foreign students studying in the U.S. Previously, the National Association of Foreign Student Advisers was responsible for sending census forms to each college and university, for compiling the results and for furnishing IIE with virtually camera-ready copy and statistical tables.

"One practical use of this capability to rework the data," Barry noted, "is that we can tell multinational corporations how many students from Venezuela, for example, are studying engineering and at what universities. They might want to hire them."

Looking at the future, Barry hopes to use the system to complete the conversion of all IIE's existing computer programs, expected to be accomplished by this month. In the meantime, he and his staff of four people — five less than the DP unit employed during the service bureau days — have been identifying operations in which the VS system can be utilized to an ever-increasing extent.

One such operation is fund raising, a vital factor in IIE's survival. IIE currently has a data base file on all contributors — corporations, foundations and individuals.

Telecommunications between IIE's headquarters and its six regional and six overseas offices was also mentioned by the institute's planning staff. "With telecommunications, a regional administrator could be provided with instant access to a grantee's master file at headquarters for information purposes or for adding or deleting items," Barry observed.

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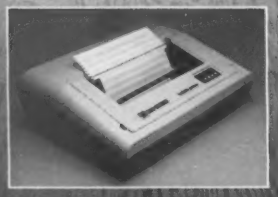

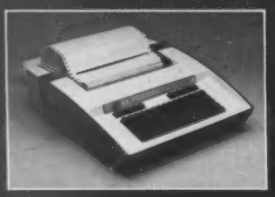

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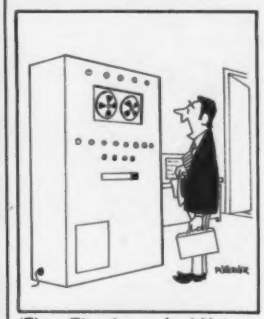

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Manufacturers Ask Protection

Senate Told Japan Hurting U.S. Semis

By Jake Kirchner
CW Washington Bureau

WASHINGTON, D.C. — Unfair Japanese trading practices seriously threaten the U.S. semiconductor industry and necessitate speedy government assistance to American manufacturers, a Senate subcommittee was told here recently.

In testimony before the Senate International Finance Subcommittee, representatives of the U.S. semiconductor industry asked for help to protect the U.S. share of the integrated circuit (IC) market in the face of increasing Japanese penetration.

Although the semiconductor industry is thriving, with worldwide sales expected to reach $10 billion this year, U.S. firms are alarmed that Japan has managed to capture an estimated 35% of the U.S. market for 16K random-access memories (RAM) in only three years. By some estimates, that figure will rise to 42% this year.

Representatives of the Electronic Industries Association (EIA) and the Semiconductor Industry Association (SIA) complained of huge Japanese government subsidies of native IC industry, predatory pricing tactics and closed Japanese markets as underlying factors in the rapid success of the Japanese at the expense of U.S. companies.

Congress was asked for changes in current tax laws to facilitate the raising of venture capital and to encourage increased research and development by American firms. In addition, U.S. trade negotiators were urged to help U.S. manufacturers gain access to Japanese buyers such as Nippon Telephone and Telegraph.

"Unless these problems are met forthrightly by our government, the American semiconductor industry could decline as a dynamic force in our economy," Intel Corp.'s Dr. Robert N. Noyce declared on behalf of the SIA.

"The U.S. integrated circuit industry is not presently hurting, but our future is threatened by foreign competition — by the Japanese in particular," added John Welty, EIA spokesman and Motorola, Inc. senior

(Continued on Page 73)

Diva Leaves Bankruptcy Court, Lands Three Large Contracts

By Marcia Blumenthal
CW Staff

EATONTOWN, N.J. — Emerging from Chapter 11 proceedings last month, Diva, Inc. started off the year winning three hefty contracts.

Although the firm operated under the protection of the bankruptcy court for 18 months, it managed to finish fiscal 1979 with earnings of $200,000 on revenues of about $2.5 million, according to Diva president Ronald S. Harmon.

Moreover, Harmon has secured future financing for Diva. Two venture capital firms, Doan Resources and Venturetech Capital, invested an undisclosed amount in the firm in November.

Ironically, Harmon noted, it was interference in Diva's management by the original

(Continued on Page 72)

Ronald S. Harmon

Dealers, IBM Meet In Joint Committee

EAST MEADOWS, N.Y. — The Computer Dealers Association (CDA) and IBM held the first meeting of their newly formed joint working committee on Jan. 17.

Created to exchange information and resolve potential or actual problems, the meeting was attended by about nine representatives, according to Harvey Berlent, president of Berlent Industries and chairman of the CDA's Industry Relations Committee.

While he declined to discuss the issues covered at the committee's inaugural session, Berlent did say a report on the proceedings would be issued far in advance of the next meeting, which will be scheduled within the next 90 days.

The committee will meet at least quarterly. Because it is a working committee, there are no permanent members other than CDA's executive director, Sidney Rose, and IBM's director of industry relations, Edward J. Kane. As specific issues arise, appropriate CDA members and IBM representatives will be asked to attend, Berlent said.

Plans for the committee were formalized at CDA's annual meeting in Houston last November.

Prime Goes After the OEMs

WELLESLEY HILLS, Mass. — Prime Computer, Inc. plunged deeper into the OEM marketplace today when it introduced two models of a general-purpose 32-bit computer system.

The Prime 250 was designed for end users while the Prime 150 is geared to the OEM market.

Unlike other minicomputer vendors who are already aggressively marketing to OEMs, Prime has made only 10% of its sales through the OEM market. However, it plans to increase that figure to nearly 25% with the entry of the 150, according to Frank Madren, director of product planning and management.

The system — part of the 50 series product line — is compatible with all of Prime's products and also offers a full range of communications software and a large memory capacity, Madren said. It's the "most compatible family in the industry — including IBM," Prime claimed.

At a starting price of $49,000, the Prime 150 can be upgraded to the 450 in a guaranteed upgrade plan which entails swapping boards for the higher level machine. The 450 was Prime's first OEM entry in the 50 series line and helped the company develop an understanding of OEM needs, Madren said.

Prime now claims to offer the most capability for the lowest price of any computer on the market. Besides the upgrade plan, the vendor is offering reductions up to 40% depending on the number of machines purchased.

Since Prime considers software important to the purchase decision, it intends to let the system builders develop software tools with the 150, thus establishing a system user base and at the same time facilitating the end-user market.

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Gains Range From 21% to 43%

Burroughs, NCR and Honeywell Earnings Rise

Despite IBM's disappointing financial results for 1979, Burroughs Corp. and NCR Corp. both posted earnings growth of 21% for the year and Honeywell, Inc.'s computer business earnings advanced a hefty 43% from last year's levels.

Burroughs reported annual earnings of $305.5 million or $7.45 per share, up from $253.3 million or $5.31 a share in the prior year. Revenues grew 15%, reaching $2.8 billion from $2.4 billion a year ago.

In the fourth quarter, Burroughs' earnings reached $132.4 million or $3.23 per share, a 19% increase from 1978 earnings of $111.3 million or $2.73 per share in the final quarter. The firm's revenues rose 12% to $881.6 million from $786 million in the year-ago period.

Rental and service revenue for the year was up 12% and purchases rose 17% from the prior year. Burroughs ended fiscal 1979 with a 12% increase in its backlog.

In Dayton, NCR also reported a 21% increase in earnings from operations, which for the year totaled $234.6 million or $8.78 per share compared with $193.7 million or $6.90 per share in 1978.

With a nonrecurring gain of $110.4 million from the sale of its Appleton Papers Division, NCR's annual earnings reached $11.25 per share.

Revenues totaled just over $3 billion, a 15% increase from 1978 revenues of $2.6 billion.

For its fourth quarter, NCR earned $98.3 million or $3.67 per share, a 9% improvement from the $89.9 million or $3.34 per share earned in the final quarter last year. Fourth-quarter revenues topped $987.8 million, a 16% increase from the $852.9 million in the same quarter in 1978.

Honeywell Up 43%

Honeywell's computer business grew 12% in revenues and 43% in earnings in 1979. Revenues from the computer operation totaled $1.45 billion, up from the $1.29 billion reported in 1978.

Of the revenues, $704.9 million was derived from computer rentals and service.

Profit from the computer portion of the firm's business reached $152 million vs. $106 million a year ago.

For 1979, Honeywell's computer business contributed 34.5% of revenues but 58% of the profits to the company's total year performance.

Revenues from all sectors of the firm's business reached $4.2 billion, up 19% from last year's revenues of $3.55 billion.

Annual earnings advanced 29% to $260.5 million or $11.89 per share from $201.4 million or $9.41 a share last year.

During the final quarter, Honeywell posted earnings of $85.1 million or $3.85 per share compared with $76.1 million or $3.54 per share in the prior year's final quarter. Revenues reached $1.23 billion from just over $1 billion in the same period a year ago.

CSC Lands Navy Job

EL SEGUNDO, Calif. — The U.S. Navy has chosen Computer Sciences Corp. (CSC) to build a naval warfare gaming system for the Naval War College in Newport, R.I.

The three-year contract is valued at $13.6 million, CSC said. The system will be installed in 1982 and CSC will maintain it for one year.

With the system, the naval college will be able to simulate real-life military situations without incurring the costs of field exercises or using its fuel reserve.

Under the turnkey contract led by the Naval Electronic Systems Command, CSC will provide both the hardware and the software for the system. It will be built at CSC's Moorestown, N.J., Defense Systems Division.

The system will include a Honeywell, Inc. Multics processor and 44 interactive remote color consoles.

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Services Ask Help Against KDD

By Phil Hirsch
CW Washington Bureau

WASHINGTON, D.C. — U.S. computer services vendors who operate in Japan last week tried again to convince the Federal Communications Commission (FCC) that they are being persecuted by Japan's overseas carrier, KDD, and that the commission ought to help them fight back.

The alleged persecution consists of restrictions imposed by KDD on international private lines leased by Control Corp., Tymshare, Inc. and other U.S. service bureau firms [CW, Dec. 31/Jan. 7]. The main restriction requires each line to be terminated in this country in a single computer system at a single location.

Since CDC and Tymshare operate multiple computer sites and distribute their data bases and application programs among them, the companies contend this restriction severely limits the services they can provide to Japanese customers, thus giving Japanese competitors an advantage.

The firms also claim that although the ostensible purpose of the restrictions is to prevent unauthorized communications between multiple remote stations, they are actually a non-tariff barrier, sanctioned by the Japanese government.

Alternative Unacceptable

KDD has offered an alternative arrangement, but CDC and Tymshare find it no more acceptable than the original: If the Americans will give up their international private lines and instead use Japan's new Venus packet-switched network, no restrictions will be imposed. To reach Venus from this country, U.S. time-sharing firms can employ packetized transmission facilities offered by Western Union International, RCA Global Communication or ITT Worldcom.

The difficulty is that the rates reportedly are at least 10 times higher than those charged for equivalent private-line service.

CDC, along with the Association of Data Processing Service Organizations (Adapso), pointed all this out to the FCC's Common Carrier Bureau last fall, when it was considering applications from the three international carriers to extend their packetized services to Japan. The service bureaus wanted the applications denied: alternatively, they said the commission should condition its approval on removal of the restrictions.

Last month, the Common Carrier Bureau, acting on delegated authority from the commission, granted the applications — basically because "no private leased line service has been discontinued or impaired so far" and "we have found it desirable to allow [the three services] to proceed . . . so that competitive forces could be the ultimate determinant of whether [they] should be provided."

Last week, Adapso asked the commission to review the Common Carrier Bureau's decision. "The bureau's failure to address the KDD restrictions, even if its conclusions with respect to these restrictions differed from those of Adapso, is sufficient grounds to set aside the bureau's order," the trade group said.

It added that the KDD restrictions, together with its pricing of Venus International Computer Access Service, "form an effective nontariff trade barrier to American data processors wishing to do business in Japan . . . The approval of nontariff trade barriers is simply not consistent with the public convenience and necessity, nor with this nation's policy in favor of free trade."

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Executive Corner

Documation Makes Three Appointments

MELBOURNE, Fla. — Documation, Inc.'s president, S. Ray Halbert, has appointed a president for the firm's European subsidiary and named three vice-presidents and a controller.

Dennis M. Mannion is the new president of Documation World Trade Corp., located in London. Formerly vice-president of operations, Mannion replaces Eugene J. Cronin Jr., who died last month.

Mannion is responsible for Documation's manufacturing operation in Ireland and 14 sales and service locations in Europe.

Named as senior vice-president of marketing, planning and field operations was William R. McEwan, formerly vice-president of special projects for Data 100 Corp. His position is a new one within the company.

Joseph F. Cattorini, now senior vice-president for Engineering, was formerly Documation's vice-president for engineering.

George A. Reed is the senior vice-president of finance and administration. He was formerly executive vice-president of Computer Systems of America, Inc.

John W. Erickson has been promoted to corporate controller.

Other Moves

• Donald F. Richard has been promoted from vice-president of Commodore Business Machines, Inc. to vice-president of the parent company, Commodore International Ltd.

Diva Exits From Chapter 11

(Continued from Page 69)

venture capital investors that started the firm on its journey to bankruptcy court [CW, April 2]. Although undercapitalizing the firm, those investors wanted Diva's revenues to advance 50% per year, which is far in excess of the industry average, Harmon explained.

To protect the firm from interference by investors, Harmon has forged a legal agreement with the two new investment firms which assures the current management will run the company. Harmon also said the prospects look good for a regular unsecured line of credit with a bank.

Without disclosing the amount of equity the venture capitalists hold, Harmon said the firm recently passed on a "sizeable" amount of the ownership of the firm to its employees. Harmon and Lee Rubin, executive vice-president, hold the remaining ownership.

Aside from securing new financing, Diva recently completed a contract with International Computers Ltd. (ICL) to develop a mass storage system for ICL's Series 10, which it acquired from Singer Business Machines. Harmon said there is now a tremendous need for upgrades for many of the 5,000 Singer systems now installed.

The two year contract is valued at about $3 million. Prototype units are scheduled to be delivered in April.

Diva has two other contracts awaiting final negotiations. One is a $1 million to $2 million award from a flight simulator firm for its mainstay product, the Computroller V, and the other is a similar award from a government agency.

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NBS to Operate Interface Verification Service

By Tim Scannell
CW Staff

WASHINGTON, D.C. — The National Bureau of Standards' (NBS) Institute for Computer Sciences and Technology has launched a computer interface verification service for federally purchased DP equipment that is expected to save the government about $61 million over the next five years.

Presently operated by an in-house technical staff, the NBS service will give a "certificate of approval" to government-procured computer equipment, ensuring that the hardware meets the I/O interface standards common to each government agency.

The checking process will "assure that when federal agencies buy equipment that is supposed to conform with a standard, that they in fact do, and . . . when you connect them they work," according to Thomas Pyke, director of the NBS Center for Computer Systems Engineering.

For now, vendors will make their DP equipment available to the NBS for testing on a reimbursable basis. If the hardware fits into federal I/O formats, then the equipment will be added to a list maintained by the General Services Administration (GSA). Government agencies will then select approved computer gear from the GSA list, Pyke explained.

Later, the NBS will institute some sort of supplier self-verification procedure that will allow vendors to test their own equipment and submit proof of conformity to the bureau, the director continued. About 70 different computer companies presently build hardware with interfaces identical or similar to government-standard interfaces.

Once a certificate of approval is issued for a certain piece of equipment, the vendor will not have to renew the document or periodically resubmit the equipment for further testing — unless the hardware is altered in any significant way or there is any indication that the device no longer conforms to standards, Pyke noted.

Standards that are recognized by the NBS include the Federal Information Processing Standard Publication (Fips Pub) 60, I/O Channel Interface Standard; Fips Pub 61, Channel-Level Power Control Interface; Fips Pub 62, Operational Specifications for Magnetic Tape Subsytems; and Fips 63, Operational Specifications for Rotating Mass Storage Subsystems.

Requests for the service or for additional information can be obtained from Dr. John P. Riganati, chief of the Systems Components Division, Center for Computer Systems Engineering, NBS, Washington, D.C. 20234.

Semi Makers Ask For Protection

(Continued from Page 69)

vice-president.

Congressional interest in the problems facing the U.S. semiconductor industry has been sparked by a recently completed International Trade Commission study of the subject. The Senate hearing followed House of Representatives' Trade Subcommittee hearing Nov. 30 on the ITC report.

According to testimony heard at the November hearing, Japanese manufacturers are selling ICs in the U.S. not only at far below their own domestic price, but at prices as much as 30% lower than comparable ICs made in the U.S.

"The real problem," Welty said, "is that both the Japanese and U.S. manufacturers forecast a moderate to healthy sales increase for the 1976 to 1978 period. In the case of the Japanese, their markets did not achieve their expectations, while in the U.S. ours greatly exceeded our expectations. Consequently, they had excess capacity and we were caught short."

To increase U.S. manufacturing capabilities, Welty recommended to the Senate panel that a 10% credit against tax be allowed for current research and development expenditures. The SIA additionally called for tax incentives to stimulate capital investment.

While those testifying on behalf of U.S. industry presented a situation that calls for quick government actions, the Electronic Industries Association of Japan (EIA-J) told the Senate subcommittee "there is every reason to expect that the U.S. semiconductor industry will remain healthy and profitable in the years to come."

William H. Tanaka, a Washington attorney representing EIA-J, noted that American IC makers still hold a considerable majority of the U.S. and European markets.

Addressing the question of Japanese government subsidies to its domestic industry, Tanaka argued that "the role of the Japanese government in this industry is small compared with the U.S. government's role in the U.S. semiconductor industry.

"The U.S. industry over the years has benefited from a high volume of government purchases, which has enabled the industry to apply economies of scale and learning experience to further its development of new and highly advanced semiconductors," Tanaka said.

He also noted that U.S. manufacturers are not able to meet the current demand for 16K RAMs. U.S. firms, however, complain that this shortfall in production was caused, at least in part, by predatory Japanese pricing that forced American firms to cut back their semiconductor manufacturing.

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Memorex Accounting Probed in U.S. vs. IBM

By Connie Winkler
CW Staff

NEW YORK — Wharton School Prof. Samuel R. Sapienza gave poor marks to the Memorex Corp. for its accounting performance in 1968-71. In testimony in the U.S. vs. IBM antitrust trial, which includes Memorex issues, Sapienza pointed to two problem areas: the manner in which Memorex accounted for the acquisition of entrepreneurial companies it formed initially and the way Memorex accounted for computer equipment leases.

Sapienza did not actually take the stand, but portions of his deposition in this case, designated either plaintiff's or defendant's, were spread on the record in a quick court session Jan. 4.

'Unique Application'

"This was a unique application of the notion of pooling of interest, without any doubt," Sapienza said about the acquisition of the entrepreneurial companies which Memorex started — with Memorex employees owning the subsidiary stock.

When Memorex acquired the profitable of these companies, it traded Memorex shares for the employees' shares. Sapienza called this a sweetheart deal.

The normal situation for pooling of interests provided the two companies be independent, in different industries and approximately the same size; that they deal with each other at arms' length and exchange common voting stock; and that one company acquire at least 90% of the other, Sapienza said.

Justice Department lawyer Alan Nisselson repeatedly asked Sapienza whether the Memorex actions were not singled out by public auditors, who would have reviewed the same things Sapienza did. Sapienza said he drew his independent decisions after reviewing Memorex's financial statements.

"The point that I want to be sure is in the record is that the extent of Memorex' [actions] . . . was extremely unusual and therefore what I would call extremely bad practice rather than saying it was an unusual practice," Sapienza said.

The fact the public accounting firm of Arthur Anderson & Co. did not question the Memorex pooling of interests may have been another instance of the "gradual erosion of the standards that was going on," Sapienza said. He saw a decline in the standards for distinguishing when to use pooling of interests and when to use purchase accounting.

"The period of the 1960s was a period of considerable activity of a combining nature where many, many corporations combined, so it certainly wasn't restricted to Memorex," he said.

IBM contends Memorex had difficulty in the late '60s and early '70s because of its accounting practices and not, as the government holds, because of IBM changes in products, pricing or maintenance practices. Sapienza said he had not studied what Memorex competitors were doing.

Lease Transactions

Sapienza also squabbled with how Memorex recorded its leases and depreciated equipment.

"They were rather generous in their interpretations of what the accounting principles existent at that time would permit them to do," Sapienza said about lease transactions with ILC Corp., a leasing company.

Memorex accounted for these transactions as sales, but Sapienza argued that not all the risks and rewards of ownership were transferred. Memorex retained the maintenance and promised "best efforts" to release the equipment.

Sapienza also questioned the nine-year depreciation term on Memorex's operating leases because it gave Memorex "relatively higher profit." He argued that because Memorex was in a high technology business it should have been "very cautious in selecting and determining a deferral policy."

Memorex also deferred research and development and marketing expenses over too long times, he said. Sapienza acknowledged he knew Memorex at that time was developing an entire computer system, and would typically release equipment longer than the one- or two-year initial lease.

Contracts

Univac's Technical Services Division has been awarded a $3.2 million contract by the U.S. Navy's Fleet Combat Direction System Support Activity at Dam Neck, Va.

System Development Corp. (SDC) has been awarded the Fourth Generation Advanced Computer System (Facs) program from the Air Force Computer Acquisition Center at Hanscom (Mass.) Air Force Base. Under the contract, SDC will provide two Cray-1 computers and support services for the Air Force Weapons Laboratory at Kirtland Air Force Base in New Mexico.

Control Data Corp. has received a contract from the U.S. Navy for the lease and maintenance of a Cyber 203 supercomputer and a Cyber 170/720 system, with associated peripheral equipment, systems software and training, to process environmental information.

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Growth Rate Drops From 30% to 22%

Study: CRT Terminal Shipments Slow in '79

WELLESLEY, Mass. — Although unit shipments of alphanumeric CRT terminals grew in excess of 30% annually for the past several years, during 1979 that segment of the industry slowed, with shipments growing by only 22%, according to a recent market study.

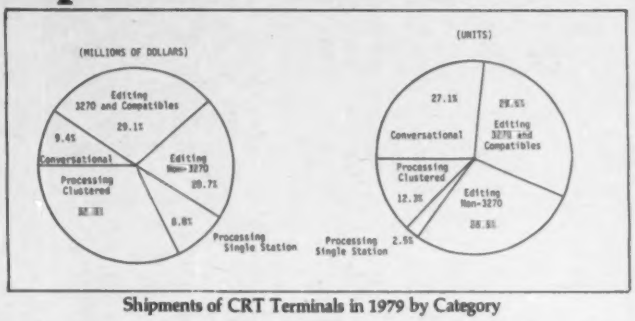
Manufacturers predicted that 1979 would have a growth rate "as good as or better than 1978," but shipments slowed after heavy backlogs from 1978 had been met, Venture Development Corp. (VDC) noted in its recently released report "Alphanumeric CRT Terminal Industry: A Strategic Analysis."

Combined shipments of conversational, editing and intelligent CRT terminals reached 473,000 units in 1979. At $1.6 billion, the dollar value for these units grew 13% since 1978, the study pointed out.

Several Segments Examined

The report examined several segments of the CRT terminal industry. Shipments of "dumb" terminals, long thought to be declining, made healthy gains. These gains were spurred primarily by price reductions and added product features, such as cursor controls and a page or two of buffered memory.

Sales of these low-end models were up 28% from 1978, the report found.



Shipments of CRT Terminals in 1979 by Category

On the other hand, shipments of IBM 3270 editing terminals and those made by IBM-compatible makers increased by only 13% during 1979, according to the report. Demand for these terminals was high, but delivery times stretched out because production rates reached their limits.

IBM's delivery problems gave 3270-compatible makers a second wind following price reductions and product enhancements announced by IBM in 1977.

VDC found that non-3270 editing CRT terminals led in shipment growth, with a 31% increase over 1978 levels. The popularity of these terminals now equals that of the 3270-types, and by 1981 shipments of non-3270 editing terminals will surpass the 3270s, the report predicted.

Commenting on intelligent or processing-type terminals, VDC noted that 1979 shipments of keystations on clustered units were up 16% from 1978's figures. VDC expects this segment to increase its annual growth rate to 28% by 1984.

IBM on Top

Analyzing the competition, the study rated IBM as the dominant manufacturer, with a 23% market share of the installed base of all alphanumeric CRT terminals. Although smaller than IBMs usual hold on the marketplace, IBM percentage was still four times greater than that of any other CRT terminal maker.

IBM's strength is in the 3270 segment, but compatible makers began to chip away at IBM's stranglehold. During 1979, 3270-compatible makers increased their share of this market by 3% and now claim a 35% portion, VDC maintained.

VDC predicted in the long run that the installed base of alphanumeric CRT terminals will grow at a compound annual rate of 21.6% for the five-year period ending in 1984.

More information on the study is available from C.B. Whichard, Senior Consultant, VDC, One Washington St., Wellesley, Mass. 02181.

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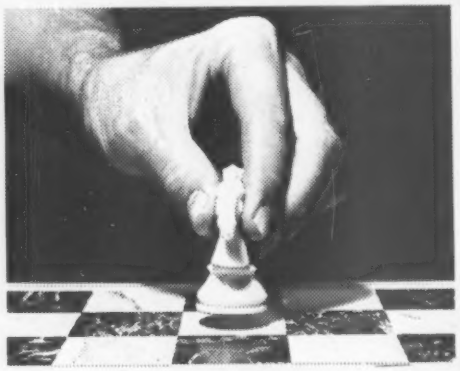

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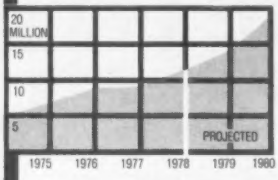

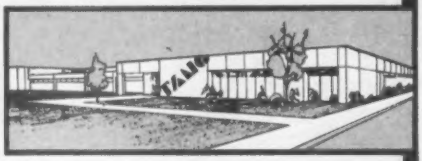

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Design on-line diagnostic software to automatically routine and localize hardware faults. Experience with recovery or diagnostic software in such areas as: CPU's, common memories, I/O, digital network complex, or line and trunk facilities is valuable.

Development Support Software

Responsible for the development of tools which aid and support the software developmeent of advanced digital telephone switching systems. Pascal experience and/or experience with PWB/UNIX time sharing systems desired.

Data Base Administration Software

Responsible for proposing a data base administration system for advanced digital systems. Perform logical and physical data base design.

Test Utility Software

Involved in design and software implementation of an automated, computer-based test system to be used in system evaluation and testing of laboratory prototypes and initial field site locations.

Call Processing and Administration Software

Involved in all areas of telephone switching control software, switch and network traffic overload management software, and system initialization and status control software.

If you'd like the chance to work on systems that go far beyond present state-of-the-art thinking and live in an environment that will meet all of your criteria for cultural and recreational opportunities, com to GTE in Phoenix today! GTE offers an excellent salary and benefits package. Please send your resume and salary requirements to:

Mr. Dave Crowley

Manager of Employment, Dept. CMW 128
GTE Automatic Electric Laboratories
11226 N. 23rd Ave.
Phoenix, Az. 85029

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PROGRAMMERS

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Requires successful design programming and implementation experience in a high transaction on-line systems environment using top-down structured design, structured walkthroughs, and quality assurance tools. BAL, TSO and MVS experience necessary.

Senior Programmer Analyst

Familiarity with Mastercharge and VISA card processing or other retail credit card applications. Requires BAL and COBOL as well as VSAM expertise. Previous project leader experience emphasizing top-down develop process, user relations and project costs management.

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Six positions require one or more of the following:

- Experience with data entry and balancing functions on the Nixdorf Entrex system.
- Previous design and implementation with strong COBOL in a structured environment. BAL desired. Will participate in the design of new financial system.
- Strong analytical and design skills with batch COBOL applications. Requires good user communications skills. Responsible for support of cardholder services.
- Analytical and top-down design experience in large scale systems using MSA components. COBOL required. Will support the modification and integration of numerous financial applications.

Chief Programmer

Requires programming and implementation experience in an on-line systems environment featuring strong financial controls in systems integrity. Strong PLI and COBOL skills.

Systems Programmer Teleprocessing

Two positions require minimum of 5 years' total data processing experience including 2-3 years' TP experience in an OS environment. Background to include:

ALC, TP access methods (VTAM, EXCP), protocols (asynchronous, binarysynchron, data link) and a working knowledge of OS internals.

Systems Programmer Applications Support

Two positions requiring a minimum of 5 years' total data processing experience in an OS environment. Background should include a working knowledge of JCL, IBM Utilities, TSO, assembly language, COBOL and on-line concepts.

Voice Response Programmers

Requires expertise in touch-tone transaction telephone systems. Background in S-1, S-7.

Technical Trainer

Requires experience in developing and administering an in-house technical training program.

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Rapidly growing Southeastern City is seeking a qualified individual to manage an on-line, interactive data base system. This individual should have experience in personnel management. Candidates must have strong background in communications and data base operations. CS Degree plus 5-7 years experience in application management desired. Experience in operation of DS/3-IMS90 helpful. Salary to $30,000. We offer a career opportunity. Send resume and references to:

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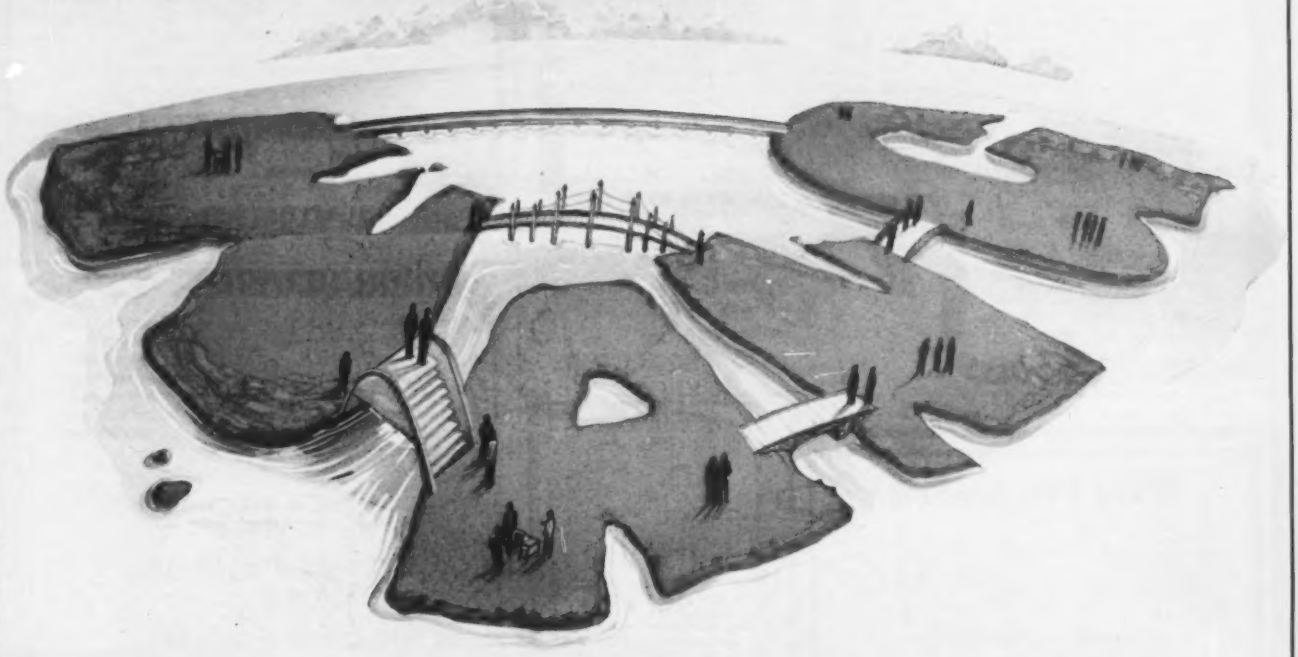

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Systems Software Development.

Data Base Development

Software Sustaining Systems Programmers

Programmers with one or more years of experience to do functional and performance enhancement to our Advanced Data Management System and utilities. Working knowledge of assembler language is required. Familiarity with data base concepts such as recovery/restart and Data Dictionary is a definite plus.

Software Systems Support Programmers

Programmers with one or more years experience with a major data base package in a user environment (banking, insurance or industrial) to program data base utilities, test programs, and marketing demonstrations. Knowledge of a higher level language (COBOL, FORTRAN, BASIC or PL1) required; knowledge of assembler language is a definite plus. You will be supporting our recently announced ADMS (Advanced Data Management System) and DBMS (Data Base Management System) products.

We offer excellent salary and benefits including profit sharing, stock purchase plan, stock bonus plan, medical and dental insurance.

Diagnostics Systems Programmers

A number of challenging positions exist in our newly formed Diagnostics Group within Office Information Systems Development. This team will devise plans to support prototype equipment check out as it is being built and tested by Engineering.

The ideal candidate will have a technical degree (BSCS BSEE), some experience on micro processor based software, and prior diagnostic programming experience with peripheral devices (e.g. disks, magnetic tapes, printers).

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We are seeking systems programmers at all levels to paricipate in the development of our Office Information Systems to support the office of the future. Applications include all of Word Processing, Electronic Mail, and Document Processing. Work will be done in PLM and Pascal for microprocessor base multi processing systems, using Z80, 8080, Z8000 and M68000 micros. All positions offer the full range of specification design and implementation of distinct parts of the product.

A degree in Computer Science or its equivalent is usually preferred.

Data Processing Opportunities

Pullman Kellogg has immediate openings in the following data processing positions at its world headquarters in Houston.

Programmer Analysts

These positions require experience in ANS COBOL with OS/VS in a large IBM system. Experience with MARK IV, CICS and data base is a plus. College degree required. Experience in a project oriented industry is preferred.

Business Systems—In addition to the above, these individuals will need a knowledge of general financial systems and how they are logically interfaced. Experience using generalized account coding systems and data base concepts would be useful.

Project Systems—Experience as above. Knowledge of project control systems, critical path, MTO, purchasing, cost status reporting, and time analysis in the engineering/construction industry would be useful.

Field Systems—General data processing with emphasis on user contact and experience with direct construction systems would be a plus.

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College graduate with a minimum of four years' business experience, at least three of which should be directly in computer systems analysis and programming. Must have in-depth working knowledge of JCL, COBOL, MARK IV, and IBM utilities.

Responsibilities include solving production application problems on a daily basis in Kellogg's worldwide data processing operations. Will deal with both programmers and users within the company on a continuing basis. Involvement in establishing procedures and methods to ensure efficient production operation also will be included.

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Applicants should have a degree and 5+ years' experience with large IBM systems. In-depth experience in the use and operation of a DBMS (preferably IDMS), and proficiency in IBM/370, COBOL, and JCL are required.

Experience in any of the following is desirable: CICS, Culprit, Mark IV, Panvalet, and TSO.

Should be highly motivated, well organized, and possess good communicative and interpersonal skills.

Responsibilities include: helping control and coordinate Kellogg's worldwide integrated database environment; consulting with application analysts in the areas of database design and technical support; schema and subschema generation; and development of database administration utilities and other specialized software.

Interested, qualified persons should send a résumé, including salary history and requirements, to Ms. Edna Stephenson, Personnel Department.

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- **Programmer Analysts**
- **Programmers**

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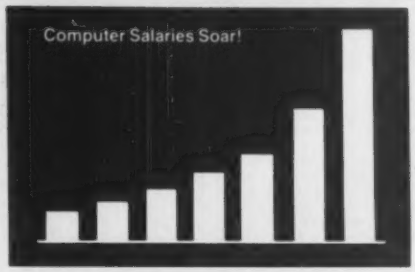

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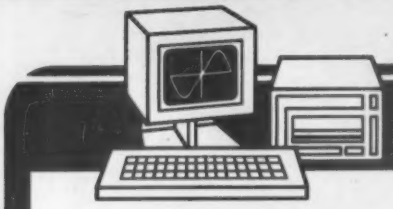

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- GRAPHICS SOFTWARE DEVELOPMENT & SUPPORT

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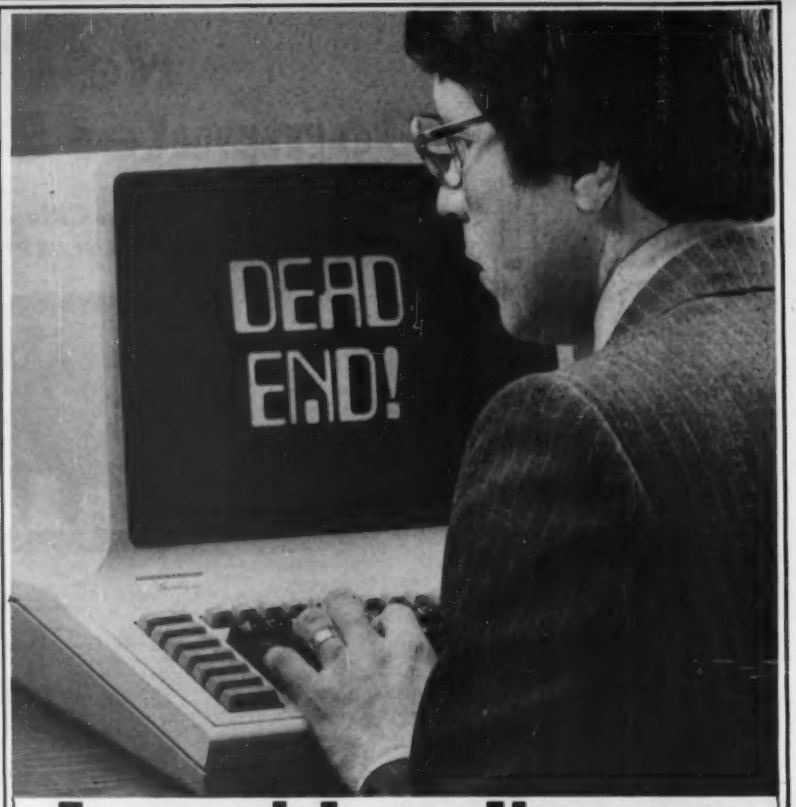

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		YES	NO
1.	Are you in a complex, dynamic business that has outstanding prospects for continued growth?	☐	☐
2.	Is your firm a leader in its field with a reputation for quality and creativity?	☐	☐
3.	Do you have an opportunity to work hard for significant responsibilities?	☐	☐
4.	Are you fairly rewarded in relation to your performance?	☐	☐
5.	Are you working in an unstructured environment relatively free of status symbols, titles, and other barriers to communication?	☐	☐
6.	Does your work include supportive team efforts that allow you to focus on getting the job done without wasting energy on company politics?	☐	☐
7.	Do you have an opportunity to test your technical, creative, and management capabilities?	☐	☐
8.	Do you have the opportunity to work closely with highly competent professionals from varied backgrounds?	☐	☐
9.	If you have an interest and can demonstrate your capabilities, will you have an opportunity to work in other areas of the business?	☐	☐
10.	Could you become an owner in your business?	☐	☐

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Computer Science Department

Applications are invited for tenure-track and visiting positions of Assistant or Associate Professor. Applicants should have a PhD degree in Computer Science, Electrical Engineering, or a related discipline. All applicants will be considered regardless of their area of specialization but preference will be given to those who specialized in software engineering, operating systems, systems programming, database management, computer architecture, computer design, mini-micro computer systems. Professional development is encouraged and expected but emphasis is on quality of teaching. One of three campuses of The University of Michigan, located on a new riverfront campus in downtown Flint, The University of Michigan-Flint offers degrees to over 4,000 undergraduate students and an increasing array of graduate and graduate/professional programs. The Computer Science Department has a Burroughs B1825 system, a logic lab and a micro computer lab. There are excellent facilities for accessing the Ann Arbor AMDAHL 470 system with access to TeleNet. The Department currently offers the BS degree in Computer Science with plans for a graduate program in Software Engineering.

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You must have a working knowledge of computer hardware. You will need to be able to spot trends, interact with industry executives and managers of the nation's largest data processing departments, produce good well-researched news and feature stories, and supervise staff writers — all under the pressure of our weekly deadlines.

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Feb. 7-8 San Fransisco (415 362 5500)
Feb. 11 - 12 am Los Angeles (714 540 2500)
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Full time, 12 month position for an experienced Programmer/Analyst in a dynamic University Computer Center. BS degree or equivalent experience in Computer Science or related field required. 2 years experience in programming and knowledge of ANSI COBOL necessary. Salary range: $15,000 to $19,000. Excellent benefit program. Submit resume and names of 3 references by February 20, 1980 to: **Lloyd Barnett, UMC 37, Utah State University, Logan, Utah 84322.** An Affirmative Action/Equal Opportunity Employer.

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Programmers — Los Angeles COBOL, CICS, IMS	To 25K
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Elizabethtown College
Computer Science Chairperson

Elizabethtown College seeks a chairperson of an autonomous program in an undergraduate, liberal arts college with strong science, business, and professional programs. A co-educational institution with enrollment near 1500, Elizabethtown College is located in south central Pennsylvania within easy access of Washington, Philadelphia, and Baltimore.

Elizabethtown College's primary computer facility is a medium-size DEC System-10 with 256K words main memory, 5 disk drives, 32 ports (with 24-hour terminal access to faculty and students), and other peripherals. In addition the College has two PDP-8's, an LSI-11, and an 8080 microcomputer.

This nine-month chairperson's position will involve teaching and administrative responsibilities, and the chairperson reports directly to the Dean of the Faculty. Requirements for the position include some balance of experience in college teaching, currency of knowledge in computer science or information systems, and recent graduation training in computer science. Preference will be given to candidates with an earned doctorate. Academic rank and salary dependent upon qualifications.

Please direct applications, including vita, list of references, and credentials to Martha A. Farver, Director of Personnel, Alpha Hall, Elizabethtown College, Elizabethtown, Pennsylvania 10722. Deadline for applications is April 15, 1980.

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SR. SYSTEMS ANALYST

The University of Missouri Central Administration has an opening for a Sr. Systems Analyst in the area of Production Systems. Responsibilities: maintain and revise existing computer systems programs to better fit needs of users, analyze information into efficiently accessible work files, prepare specifications for system improvements, and define security and control procedures.

Qualifications: Bachelor's degree in computer science, business or related area or an equivalent combination of education and experience. Four to five years experience in systems analysis and design techniques is necessary. Experience in on-going production systems and programs is desirable.

Salary range: $17,792 - $26,800.

Send resumes to:

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PERSONNEL SERVICES
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Experience in more than one of the following communications software required: IMS, CICS, IDMS-DC, DMIV, Task Master, Datacom, Environ. Willingness to travel. Salary to $35,000.

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Applicants should have strong background in COBOL, Data Base Management Systems, and Communications. Experience in supporting manufacturing applications is desirable. Some travel. Salary to $25,000.

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SYSTEMS PROGRAMMERS

Our client, a blue chip manufacturer, has challenging opportunities to support distributed processing currently installing IBM 4300's in sites throughout the Southeast, Rockies and Pacific Northwest. Individuals will support local MIS staff and be responsible for generation and performance evaluation of VM/OS/VS 1/ CICS and related system software. Excellent potential for growth and learning utilizing latest IBM hardware and software. Strong salary and benefit package.

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The economy for 1980 in the Pacific Northwest is healthy and growing. We offer a mild climate, affordable housing, accessible recreation, no sales tax (Oregon) and no state income tax (Washington). Generous relocation packages available. To explore a career move, call collect:

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360/370 OS CICS Site Planning 4341 seeks heavily expd Mgr to run busy installation. Excint sal, bonus, benefits & career Management oppty. Reply in confidence to:

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PROGRAMMER ANALYST

PDP11/70 RSTS/E BP2 RMS/11K

Requires 3 to 5 years data processing experience including at least two years experience programming in Basic + under RSTE/E on PDP11. Experience with RMS/11 preferable. Experience in systems analysis and design a plus. Degree preferred. **Send resume & salary history to Jensen Tools, Inc., P.O. Box 22030, Tempe, Az, 85282.** EEO/M/F/H.

SYSTEMS AUDITOR

A major North Carolina bank has an immediate opening for a SYSTEMS AUDITOR in the AUDIT DEPARTMENT. This Charlotte, North Carolina-based position requires a relevant degree, 2-4 years experience in programming and systems design. Experience should be on third generation equipment and should include a knowledge of OS, JCL and COBOL. Strong accounting and/or auditing experience preferred.

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We are seeking a project leader who can be responsible for our new applications software group and architectural definition of Word Processing products. You will be overseeing the development of software modules and the Word Processing text editor. A detailed knowledge of data structures and text editing techniques is required — as is a background in the management and implementation of complex software systems.

Our location also offers notable attractions. Columbia is the home of the University of South Carolina, and we're within reach of the seashore and Great Smokies. Taxes are low and housing is affordable.

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Requires a combination of education and experience equal to a BS in Computer Science, Business or related field and 5 years experience in detailed DP systems analysis including 1 year as a project leader with full responsibility for the development and implementation of a major DP system. A background in utility billing or customer service and experience with UNIVAC 1100 desirable. Salary to mid $20's.

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Programmer/ Analysts

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Several of our Bay Area clients have immediate openings for IBM/OS/COBOL Programmer/ Analysts with a minimum of 2 years experience. Prefer Manufacturing, Finance or Distribution Applications. Positions include relocation and excellent benefit packages.

We are consultants to management. Please call or send resumes in confidence to: Sam Samarrai, Data Directions, 7700 Edgewater Dr., Oakland, CA 94621 (415) 632-4303. Employer assumes fee.

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We'll offer you all the challenge you need and provide a stimulating work environment where you can use your talents to the fullest. For consideration, please send resume with salary history/requirements to Professional Employment, Dept. CK-150, 3939 Fabian Way, Palo Alto, CA 94303- or call 494-7400, Ext. 5239. An equal opportunity employer m/f.

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Indianapolis based construction management/general contractor seeks an experienced individual to assist in development and conversion to HP3000 III system. 3 years experience Fortran and Cobol required. Knowledge of: image/DBMS, view data base concepts a plus.

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If you are willing to meet the challenge of technological innovation, we invite you to send a resume to:

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Attn: Linda Kyle or

Call (408) 734-9000 for immediate consideration.

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Security Pacific Bank, the 2nd largest bank in California has a current opening at corporate headquarters in Los Angeles for a Programmer Analyst.

The qualified candidate we seek should have a minimum of 2 years of programming experience using at least two of the following high level languages: COBOL, FORTRAN, BASIC/BASIC-PLUS, or PASCAL. We prefer the candidate to have experience on a DEC-PDP 11 or any mini-computer background. Experience in real time financial applications is also helpful. Must have the ability to communicate effectively.

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LCH 52
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SYSTEMS PROGRAMMER

Bachelor's degree and a minimum of four (4) years programming experience (one year of which must have been in systems programming related tasks in a DIOS/VS environment); proficiency in assembler language also required.

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Date of Vacancy: Immediately
Deadline for receiving resumes: February 4, 1980

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You posses at least one years experience using DL/I and CICS/DMS as a COBOL Programmer and a degree in Computer Science or related area, with emphasis on data collection and manipulation.

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CF&I Steel Corporation is the nation's 12th largest steel company producing in excess of one million tons of steel per year. Help us meet our data base development goals and we will help you meet your long-range data processing career goals.

If you meet the above requirements and seek a challenging opportunity, excellent salary and steel industry benefit package, submit your resume with a cover letter and salary objectives to D. Kaderli, Dept. CW1/28:

CF&I Steel Corporation
P.O. Box 316 - Pueblo, CO 81002

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We are a nationwide professional DATA PROCESSING EMPLOYMENT FIRM specializing in airline, banking, insurance and manufacturing companies.

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Chuck Williams (602) 955-3359
THE DATA CENTER
3150 N. 24th St.
Phoenix, Arizona 85016

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ANNOUNCEMENT OF VACANCY FOR SEPTEMBER 1980

Assistant or Associate Professor of Management Information Systems for a position dependent upon subsequent funding. Individuals considered should have a strong background in computer systems applications, quantitative decision making and related management information and control systems. An interest in public sector applications is desirable. A Ph.D or other terminal degree in a relevant discipline and evidence of research capabilities or research potential are required. Compensation is dependent upon qualifications. This will be a tenure track appointment in a teaching unit providing undergradate and graduate professional level education in public systems management and in science, technology policy and administration.

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Systems Programmer

This is a senior-level position requiring at least 3-5 years' experience and a strong background in one or more of the following: DOS/VS SYSGEN, CICS, DL/1, Data Base and Assembler.

Programmers

These positions require at least 2 years' COBOL programming experience working with on-line applications programs.

You will work in a thoroughly professional environment. Our salaries will be highly competitive and in-line with your experience. We also offer a very comprehensive benefits package.

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With a minimum of 2 years experience in programming COBOL - FORTRAN. Experience in Univac 1100 systems preferred. Some experience in mass storage on 1100's desirable. Large scale systems experience essential.

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SofTech is developing compilers for state-of-the-art programming languages with features such as abstract data types, exception handling, parallel processing, and support for large systems development. In addition, we are using advanced global, machine independent and target specific optimization techniques to produce highly efficient compilers that can easily be retargeted and rehosted for new processors. SofTech is developing such compilers in host environments that include the IBM 370, DEC 10, HIS 6180, PDP 11/70 and VAX 11/780, Interdata 8/32 and CDC 6600.

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Responses to James Whitlock, Manager of Academic Systems.

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- CPU Compass
- PPU Compass
- FORTRAN and/or COBOL

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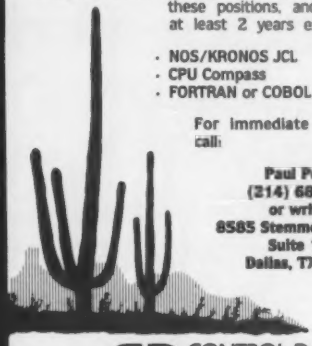
- NOS/KRONOS JCL
- CPU Compass
- FORTRAN or COBOL



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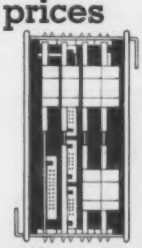

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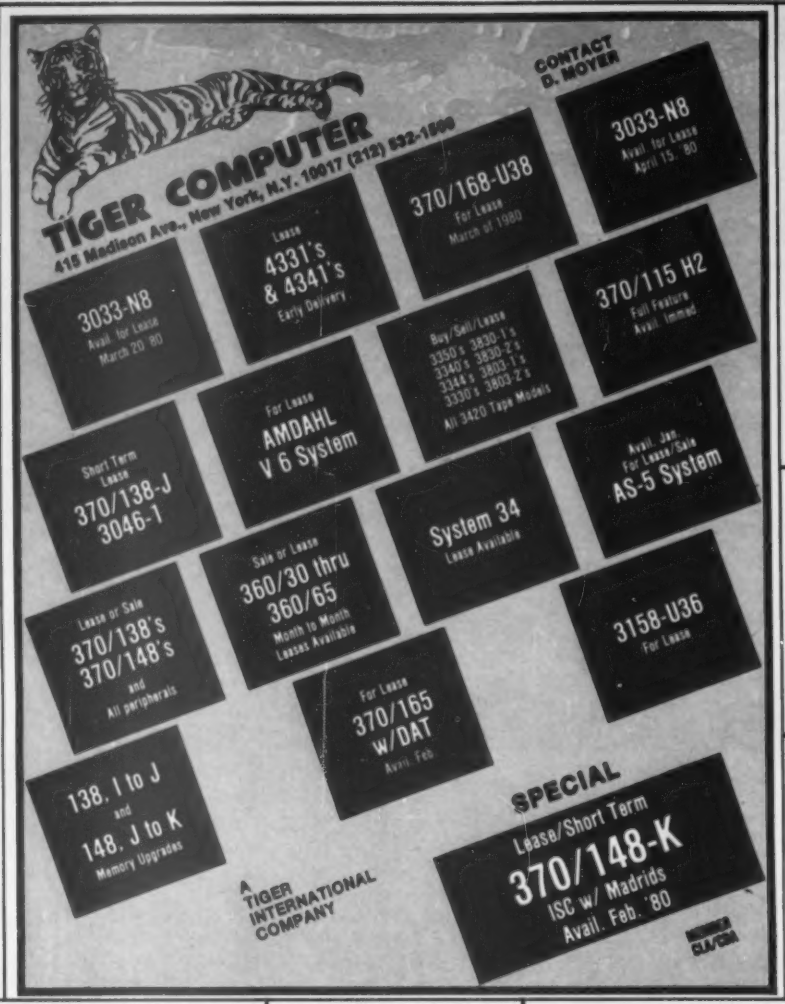
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Request for Proposal No. 530 due 3:30 P.M., Thursday, February 28, 1980, for the acquisition of two UTS400 plugcompatible intelligent terminals with standalone data entry and communications compatibility to a Univac 1100/80.

Detailed specifications may be obtained from the CDPA office. The CDPA reserves the right to reject any and all bids and proposals and to waive informalities.

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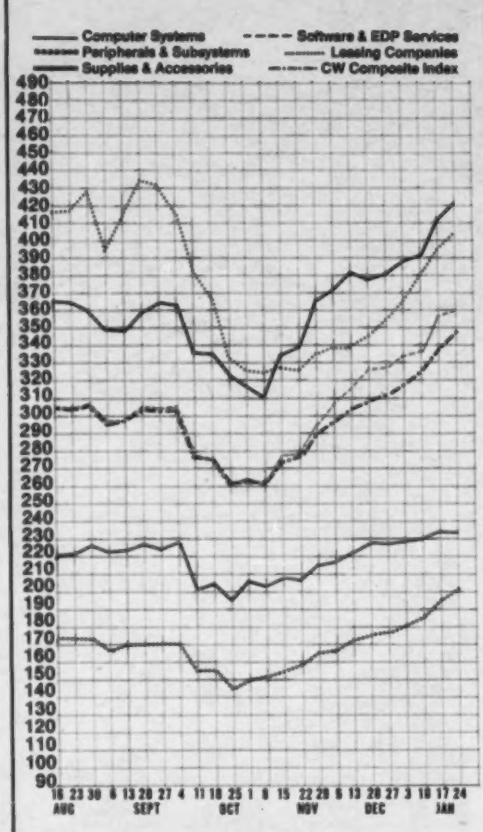
Computerworld Stock Trading Index



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Computerworld Headquarters
375 Cochituate Road
Framingham, Mass. 01701
Phone: (617) 879-0700
Telex: 95-1153

SALES
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Frank Collins
Manager,Display Advertising
William J. Mills
Manager, Classified Advertising
COMPUTERWORLD
375 Cochituate Road
Framingham, Mass. 01701
Phone: (617) 879-0700
Telex: 95-1153

BOSTON
Robert Ziegel
Northern Regional Manager
Chris Lee
Senior Account Manager
Edward P. Marecki, Jr.
Account Manager
Kathy Doyle
Account Coordinator
COMPUTERWORLD
375 Cochituate Road
Framingham, Mass. 01701
Phone: (617) 879-0700
Telex: 95-1153

NEW YORK
Donald E. Fagan
Eastern Regional Manager
Mike Eisenkraft
District Manager
Peter Senft
District Manager
Candy Kelly
Account Coordinator
COMPUTERWORLD
2125 Center Avenue
Fort Lee, N.J. 07024
Phone: (201) 461-2575

CHICAGO
Thomas H. Knorr, Jr.
Midwestern Manager
Jane Wrightman
Account Coordinator
COMPUTERWORLD
230 North Michigan Avenue
Chicago, Ill. 60601
(312)782-7565

LOS ANGELES
Jim Richardson
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Bob Hubbard
Account Manager
Kathie Knox
Account Coordinator
COMPUTERWORLD
3420 Ocean Park Boulevard
Suite 3020
Santa Monica, Calif. 90405
Phone: (213) 450-7181

SAN FRANCISCO
William J. Healey
Western Regional Manager
Ruth Gordon
Account Coordinator
COMPUTERWORLD
353 Sacramento Street
Suite 600
San Francisco, Calif. 94111
Phone: (415) 421-7330

JAPAN
Mr. Shigema Takahashi
General Manager
DEMPA/COMPUTERWORLD
1-11-15 Higashi Gotanda
Shinagawa-ku, Tokyo 141
Phone: (03) 445-6101
Telex: J2424461

UNITED KINGDOM
Steve Burton
IDG PUBLISHING LTD.
140-146 Camden Street
London NW1 9PF
Phone: (01) 267-1201
Telex: UK-264737

Euan C. Rose
BEERE, HOBSON ASSOCIATES
34 Warwickshire Kenilworth
Warwickshire, CV8 1HE
Phone: (0926) 57619
Telex: UK-311951

WEST GERMANY
CW PUBLIKATIONEN
Friedrichstrasse 31
8000 Munich 40
Phone: (089) 34-90-61
Telex: W.Ger-5-215250-HKFD

AUSTRALIA
Alan Power
COMPUTERWORLD PTY. LTD.
3 Bruce Street
Crows Nest, NSW 2065
Phone: 929-5388
Telex: SECCO AA25468

BRAZIL
Eric Hippeau
COMPUTERWORLD do BRAZIL
Servicos e Publicacoes Ltda.
Rua Alcindo Guanabara
25/10th floor
20031 Rio de Janeiro, RJ
Phone: (021) 242-7395
Telex: 11-32017 (WORD BR)

Computerworld Stock Trading Summary

TRADE QUOTES

CLOSING PRICES WEDNESDAY, JANUARY 23, 1980

All statistics compiled, computed and formatted by TRADE QUOTES, INC. Cambridge, Mass. 02139

E X C N		1979-80 RANGE (1)	CLOSE JAN 23 1980	WEEK NET CHNGE	WEEK PCT CHNGE
	COMPUTER SYSTEMS				
A	AMDAHL CORP	17- 69	25 3/4	- 1/8	-0.4
N	BURROUGHS CORP	59- 87	82 1/4	+1 5/8	+2.0
O	COMPUTER AUTOMATION	9- 44	12 3/4	- 1/2	-3.7
N	CONTROL DATA CORP	23- 68	57	-2 7/8	-4.8
O	CRAY RESEARCH INC	8- 57	56 1/4	+6 3/4	+13.6
N	DATA GENERAL CORP	42- 74	62 3/4	-3 3/4	-5.6
N	DATAPOINT CORP	34-113	107 3/4	-4 7/8	-4.3
N	DIGITAL EQUIPMENT	39- 78	68 3/4	+1 3/8	+1.9
N	ELECTRONIC ASSOC.	2- 13	8 1/4	- 1/4	-2.9
A	ELECTRONIC ENGINEER.	9- 19	17 7/8	- 1/4	-1.3
N	FOUR-PHASE SYSTEMS	19- 47	34 1/2	+1 1/2	+4.5
N	FOXBORO	26- 44	39 7/8	+ 5/8	+1.5
O	GENERAL AUTOMATION	7- 26	17 3/4	+ 5/8	+3.6
O	GRI COMPUTER CORP	1- 3	3	+ 1/4	+50.0
N	HEWLETT-PACKARD CO	29- 63	62 1/4	+ 1/8	+0.2
N	HONEYWELL INC	43- 91	91 3/8	+2 1/4	+2.5
N	IBM	42-321	71 1/4	+1 1/4	+1.7
N	MANAGEMENT ASSIST	9- 29	16	- 7/8	-5.1
O	MANUFACTURING DATA S	9- 38	35 1/2	- 1/2	-1.3
O	MINI-COMPUTER SYST	2- 8	4 3/4	+ 1/4	+5.5
O	MODULAR COMPUTER SYS	7- 18	11 7/8	- 3/8	-3.0
N	NCR	37- 81	77 1/4	-1 5/8	-2.0
N	PRIME COMPUTER INC	9- 27	25	-1	-3.8
N	PERKIN-ELMER	17- 45	42 1/4	-1 1/4	-2.8
N	SPERRY RAND	33- 57	55 7/8	-1 1/4	-2.1
A	SYSTEMS ENG. LABS	11- 24	21 5/8	+2	+10.1
O	TANDEM COMPUTERS INC	13- 44	43 1/2	+1 1/2	+3.5
A	WANG LABS.	6- 40	39 1/2	+3 5/8	+10.1
	LEASING COMPANIES				
O	BOOTHE FINANCIAL CP	13-.21	16 1/2	0	0.0
O	COMDISCO INC	3- 21	15 3/4	0	0.0
A	COMMERCE GROUP CORP	1- 1	3/8	0	0.0
A	COMPUTER INVSTRS GRP	1- 7	3 1/2	+ 1/2	+16.6
O	CONTINENTAL INFO SYS	3- 15	4 1/8	+ 1/8	+3.1
N	DATRONIC RENTAL	1- 4	2 5/8	0	0.0
A	DCL INC	3- 6	5 1/4	+ 1/8	+2.4
N	DPF INC	7- 14	7 3/8	- 1/4	-3.2
N	ITEL	4- 36	5 1/8	- 1/2	-8.8
N	LEASCO CORP	24- 61	60 7/8	+2 7/8	+4.9
O	LEASPAC CORP	1- 4	1 1/8	0	0.0
A	PIONEER TEX CORP	2- 7	3 3/4	+ 1/4	+7.1
N	U.S. LEASING	12- 20	15 3/4	- 1/4	-1.5
	SOFTWARE & EDP SERVICES				
O	ADVANCED COMP TECH	1- 2	1	0	0.0
O	ANACOMP INC	8- 24	18	0	0.0
O	ANALYSTS INTL CORP	3- 6	5 5/8	- 1/8	-2.1
A	APPLIED DATA RES.	8- 17	8 3/4	- 1/4	-2.7
N	AUTOMATIC DATA PROC	24- 40	39	+ 3/4	+1.9
O	COMPU-SERV NETWORK	9- 18	18	- 1/8	-0.6
O	COMPUTER HORIZONS	1- 9	8	0	0.0
O	COMPUTER NETWORK	5- 16	7	+ 3/8	+5.6
N	COMPUTER SCIENCES	8- 21	21	- 1/8	-0.5
O	COMPUTER TASK GROUP	1- 7	7	0	0.0
O	COMPUTER USAGE	2- 4	3 7/8	0	0.0
O	COMPUT AUTO REP SVC	4- 10	7 1/2	+ 3/8	+5.2
O	COMSHARE	6- 26	18 1/4	-1 3/4	-8.7
O	CULLINANE CORP	14- 33	29 1/2	+1 1/2	+5.3
O	DATA DIMENSIONS INC	1- 9	1 5/8	0	0.0
O	DATATAB	1- 4	1 1/8	0	0.0
O	DSI CORP	4- 9	7 3/4	+ 1/4	+3.3
N	ELECTRONIC DATA SYS.	15- 28	25 1/4	-1 3/8	-5.1
O	INSYTE CORP	1- 3	1 1/2	+ 1/8	+9.0
O	IPS COMPUTER MARKET.	2- 3	3	0	0.0
O	KEANE ASSOCIATES	3- 8	7 1/2	0	0.0
O	KEYDATA CORP	1- 5	4 5/8	0	0.0
A	LOGICON	10- 21	19 7/8	- 1/8	-0.6
O	NATIONAL DATA CORP	7- 17	17 1/8	+ 3/4	+4.5
N	PLANNING RESEARCH	4- 10	6 3/4	- 1/4	-3.5
O	PROGRAMMED TAX SYSTS	3- 5	5 1/4	+ 3/8	+7.6
O	PROGRAMMING & SYS	1- 1	7/8	0	0.0
O	RAPIDATA INC	3- 7	5	- 1/4	-4.7
O	REYNOLDS & REYNOLD	18- 36	25	-2	-7.4
O	SCIENTIFIC COMPUTERS	3- 14	13 3/4	+2	+17.0
N	TYMSHARE INC	18- 54	51 1/4	-1	-1.9
A	URS SYSTEMS	5- 10	9 1/2	+ 7/8	+10.1
N	WYLY CORP	1- 7	6 7/8	- 1/8	-1.7
	PERIPHERALS & SUBSYSTEMS				
N	AM INTERNATIONAL	13- 32	18 3/4	+1 3/4	+10.2
N	AMPEX CORP	18- 22	19 5/8	+1 7/8	+8.7
O	ANDERSON JACOBSON	5- 16	15 3/4	- 1/8	-0.7
N	APPLIED DIG DATA SYS	8- 22	8 1/2	- 3/8	-4.2
O	AUTO-TROL TECHNOLOGY	14- 30	30 1/4	+1 1/4	+3.2
O	BEEHIVE INT'L	3- 7	5 3/4	+ 1/8	+2.2
A	BOLT,BERANEK & NEW	6- 19	17 7/8	+1 3/8	+8.3
N	BUNKER-RAMO	10- 32	30 1/2	+ 3/4	+2.5
O	CAMBRIDGE MEMORIES	1- 9	2 1/2	+ 5/8	+33.3
O	COMPUTER DEVICES INC	5- 9	8 3/8	- 7/8	-9.4
N	CENTRONICS DATA COMP	16- 54	38 5/8	- 1/4	-0.6
O	COGNITRONICS	1- 4	2 5/8	- 1/4	-8.6
O	COMPUTER COMMUN.	4- 10	6 1/8	+ 1/4	+4.2
O	COMPUTER CONSOLES	4- 23	21 1/2	+1	+4.4
O	COMPUTER EQUIPMENT	3- 6	6	- 1/8	-2.0
O	COMPUTER TRANSCEIVER	1- 5	3	- 3/8	-11.1
O	COMPUTERVISION CORP	5- 58	56 7/8	- 3/8	-0.6
N	CONRAC CORP	13- 26	18 1/2	- 1/2	-2.6
A	DATA ACCESS SYSTEMS	0- 11	10	- 1/8	-1.2
A	DATA PRODUCTS CORP	13- 25	23 1/2	+1 1/4	+5.6
O	DATUM INC	2- 6	2 1/2	+ 1/8	+5.2
O	DECISION DATA COMPUT	2- 6	2 7/8	- 1/8	-4.1
O	DELTA DATA SYSTEMS	1- 2	2	+1 1/8	+128.5
N	DOCUMATION INC	6- 34	15 1/2	-1 1/2	-8.8
O	DYNARAM CORP	0- 35	34 1/2	+2	+6.1
N	ELECTRONIC M & N	3- 9	8 1/2	0	0.0
O	EVANS & SUTHERLAND	20- 42	40 1/2	+1 1/2	+3.8
O	FABRI-TEK	1- 2	7/8	-	-6.2
O	GENERAL COMPUTER SYS	1- 3	1 7/8	- 1/4	-11.7
O	GENERAL DATACOMM IND	9- 24	23 3/4	8	0.0
N	HAZELTINE CORP	10- 27	27	+2	+8.0
N	HARRIS CORP	17- 39	38 1/2	- 3/8	+0.9
O	INFOREX INC	1- 11	2	+ 1/8	+6.6
O	INFORMATION INTL INC	7- 13	12 1/4	+ 1/2	+4.2
O	INFOTON	1- 4	3 1/4	0	0.0
O	INTEL CORP	26- 72	68	-2 1/2	-3.5
O	INTERSIL	7- 32	27 1/8	+1 1/4	+4.8
A	LUNDY ELECTRONICS	4- 11	11 1/8	+1 5/8	+17.1
O	MSI DATA CORP	4- 10	10	- 5/8	-5.8
N	MEMOREX	17- 59	17 1/2	- 1/8	-0.7
N	MOHAWK DATA SCI	6- 16	17	+ 1/2	+3.0
O	OMEX	2- 9	9	0	0.0
O	PARADYNE CORP	9- 31	29	-1 1/2	-4.9
A	PENRIL CORP	5- 18	13 3/8	- 3/8	-2.7
A	POTTER INSTRUMENT	2- 2	1 3/4	0	0.0
O	RANTEK CORP	7- 15	14 5/8	- 1/2	-3.3
O	RECOGNITION EQUIP	9- 13	7 7/8	+ 1/4	+3.2
O	SCAN DATA	1- 8	2 1/2	-	-2.4
N	STORAGE TECHNOLOGY	14- 46	15 7/8	- 5/8	+4.1
O	SYKES DATATRONICS	4- 25	23 1/2	-1	-4.0
O	T BAR INC	11- 26	25 3/4	+1	+4.0
A	TEC INC	4- 13	6 3/8	+ 3/8	+6.2
N	TEKTRONIX INC	33- 64	63	+ 3/4	+1.2
N	TELEX	2- 9	4 1/8	+ 1/4	+6.4
O	TESDATA SYSTEMS CP	8- 26	13 1/8	+1 5/8	+14.1
O	TIMEPLEX INC	4- 12	12 3/8	+ 1/8	+1.0
O	WILTEX INC	1- 2	1/4	0	0.0
	SUPPLIES & ACCESSORIES				
A	AMERICAN BUS PRODS	6- 12	10 7/8	+ 1/4	+2.3
O	BALTIMORE BUS FORMS	1- 4	1	0	0.0
N	BARRY WRIGHT	14- 34	24	- 5/8	-2.5
O	CYBERNATICS INC	1- 1	1	0	0.0
O	DUPLEX PRODUCTS INC	13- 31	26	- 1/2	-1.8
N	ENNIS BUS. FORMS	8- 21	17 3/4	- 1/8	-0.6
N	3M COMPANY	63- 86	49 1/4	+1 1/4	+2.6
O	MOORE CORP LTD	28- 34	31 3/4	+ 1/4	+0.7
N	NASHUA CORP	18- 37	29 3/4	- 1/8	-0.4
O	STANDARD REGISTER	20- 29	27 1/2	0	0.0
A	TAB PRODUCTS CO	8- 19	18 3/8	+ 7/8	+5.0
A	WABASH MAGNETICS	10- 22	14	- 3/8	-2.6
N	WALLACE BUS FORMS	18- 33	30 1/8	- 1/8	-0.4

EXCH: N=NEW YORK; A=AMERICAN; P=PHIL-BALT-WASH
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